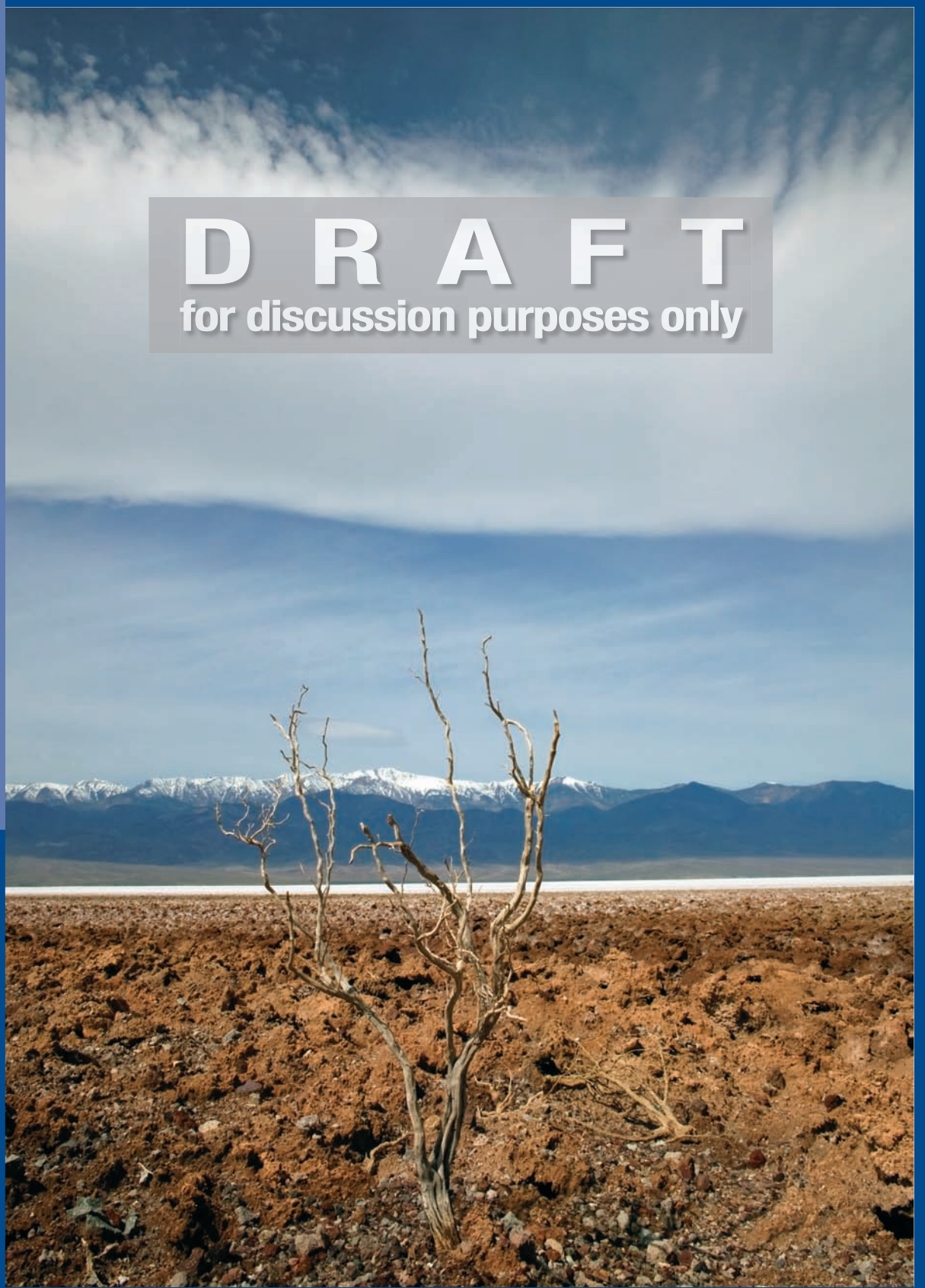
6

Science Standard 6.5.d.

Supporting Materials

California Education and the Environment Initiative



Playing the Same Role

D R A F T
for discussion purposes only

California Education and the Environment Initiative

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Project Managers for the Education and the Environment Initiative:

Andrea Lewis, Assistant Secretary
Cal/EPA

Mindy Fox, Director
Office of Education and the Environment
California Integrated Waste Management Board

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CONTRIBUTORS

Author: **Rebecca Watts Hull**
California Connections Author: **Deborah Foss**
Principal Consultant: **Dr. Gerald A. Lieberman**, Director, State Education and Environment Roundtable
Managing Editor: **Jennifer Rigby**, Director, The Acorn Group

Office of Education and the Environment
1001 I Street • Sacramento, California 95812 • (916) 341-6769
http://www.calepa.ca.gov/Education/EEI/

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Activity Masters

Visual Aids

Name: _____

Multiple Choice: Select the best answer and circle the correct letter.
(One point each)

1. The network of feeding relationships in an ecosystem is called a:
   a. flow chart
   b. food web
   c. biome
   d. energy pyramid

2. The type of biome found in an area is determined by its:
   a. climate
   b. animals
   c. plants
   d. all of the above

3. A climatogram shows a biome's:
   a. precipitation
   b. latitude
   c. temperature
   d. temperature and precipitation

4. Biomes that are very cold and dry are:
   a. tundra/polar and chaparral
   b. deciduous forest and desert
   c. taiga and savanna
   d. tundra/polar, taiga, and alpine

5. A middle latitude biome dominated by broad-leafed trees that has four seasons is:
   a. rainforest
   b. taiga
   c. deciduous forest
   d. tundra/polar

6. The biome dominated by coniferous trees is:
   a. taiga
   b. tundra/polar
   c. deciduous forest
   d. rainforest

7. Feral pigs fill the ecological role of:
   a. carnivore
   b. omnivore
   c. decomposer
   d. producer

Name: _____

Matching Draw a line between the name of biome and the correct photograph. (One point each)

1. Rainforest

2. Taiga

3. Tundra/polar

4. Grassland

5. Desert

6. Deciduous forest

7. Chaparral

Name: _____

Short Answer

1. Name the three biomes found in California. Describe the climate, common vegetation, and plant characteristics of each one. (One point for naming the biome and one point for each characteristic listed up to three.)

   a. Biome: _____

   Description: _____

   _____

   _____

   _____

   b. Biome: _____

   Description: _____

   _____

   _____

   _____

   c. Biome: _____

   Description: _____

   _____

   _____

   _____

2. Do prairie dogs and coyotes play the same ecological role in the American grassland biome? Explain your answer. (5 points)

   _____

   _____

   _____

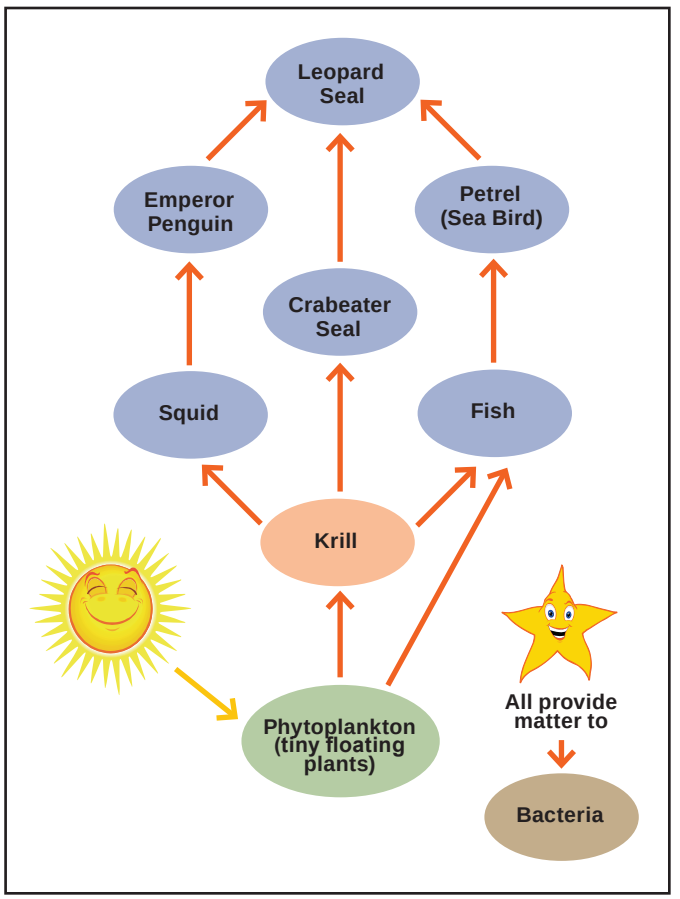
   _____

   _____

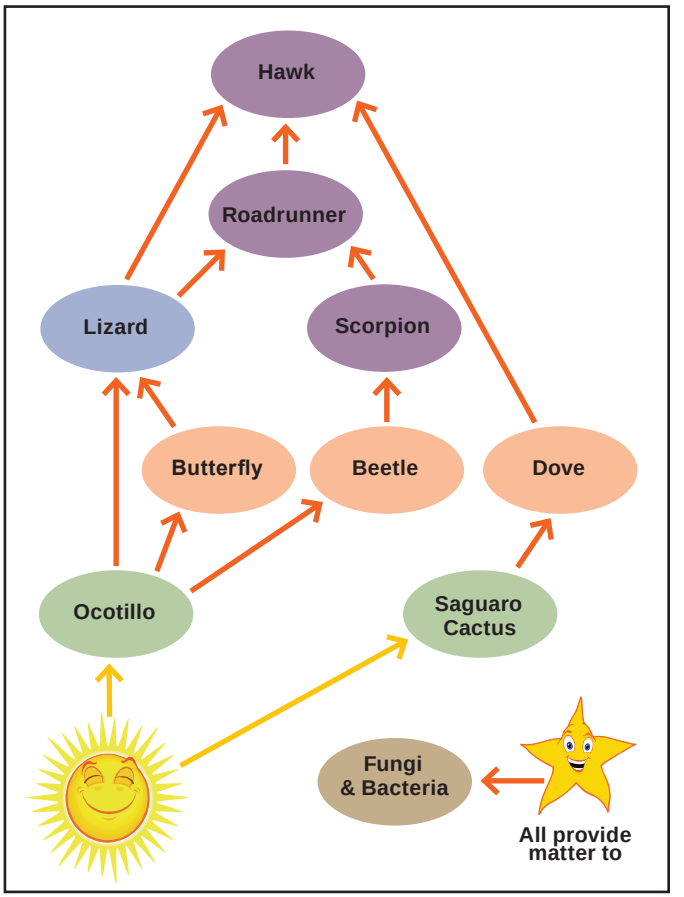
Name: _____

Use the two food webs below to answer Questions 3 and 4.

Antarctic Food Web



Sonoran Desert Food Web



3. Find an organism in the first web and one in the second web that are playing the same ecological role.

   Organism in the Antarctic food web (One point): _____

   Organism in the desert food web (One point): _____

   Ecological role that they share (One point): _____

Name: _____

4. "Overharvesting" is a human practice of taking more organisms from a population than what the population can replace. (Six points total)

   a. Explain how overharvesting the fish might directly and indirectly affect the Antarctic food web.

   b. Explain how overharvesting the lizards might directly and indirectly affect the desert food web.

c. Compare and contrast the two situations:
   - In what ways might the outcomes of overharvesting be similar?
   - In what ways might they be different?

Name: _____

Choose any two biomes. Use them to complete the following chart and writing/drawing assignment. Fill in the names of the biomes at the top of the chart.

	Biome:	**Biome:**
Choose the correct photo from the photo page and paste it in place here.		
Describe the location and climate of the biome.		
Describe the typical vegetation.		

Name: _____

	Biome:	**Biome:**
Describe at least two characteristics that plants living in the biome might have.		
Name one producer, one herbivore, one carnivore, one omnivore, and one decomposer that might live in the biome.	Producer: _____ Herbivore: _____ Omnivore: _____ Carnivore: _____ Decomposer: _____	Producer: _____ Herbivore: _____ Omnivore: _____ Carnivore: _____ Decomposer: _____

Imagine that human practices cause the number of one of the main producers in each of your biomes to decline. Choose one of your biomes. Describe or draw what might happen. How would this affect the transfer of matter through the foods webs? Include at least two changes that might occur. The changes can be direct or indirect changes.

Name: _____

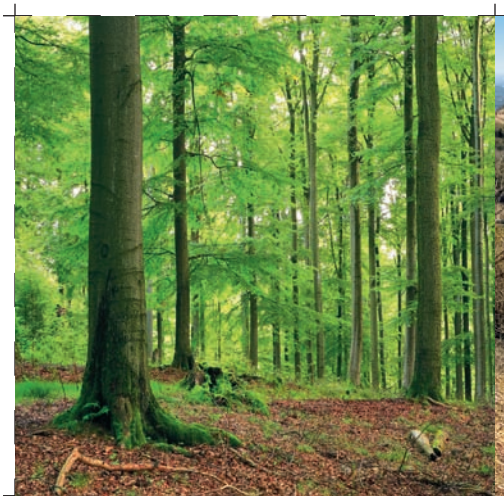
How would the responses in each of your biomes be similar?

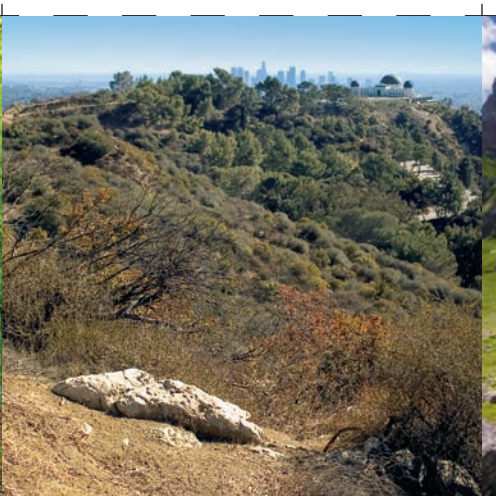
How would the responses in each of your biomes differ?

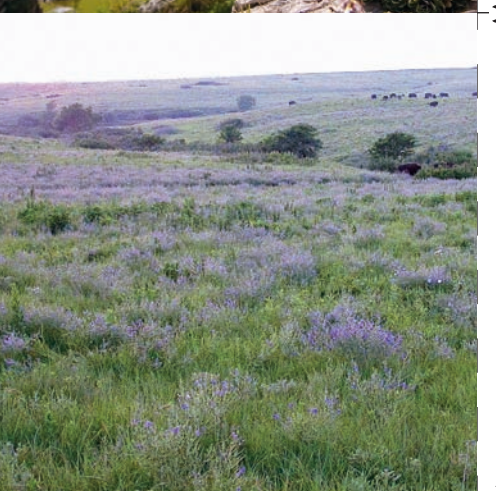
Biome Photos

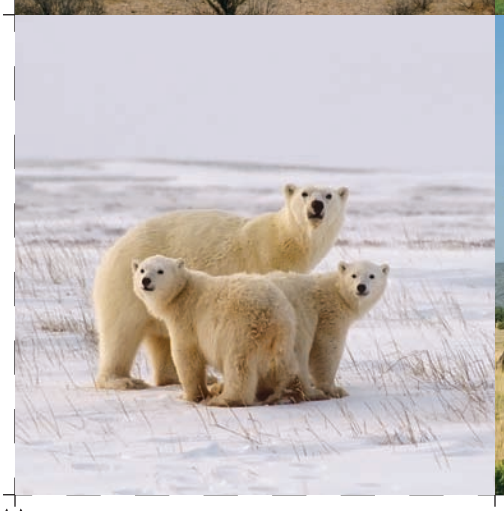
Alternative Unit Assessment Master

Name: _____









Name: _____

Directions: These words may be new to you, but you may have an idea of what they mean. Write your own definition for each word in the column "My Definition." Then, for homework, fill in the "Unit Dictionary Definition" column. Write the correct definition in your own words. You may use ***A Tale of Feral Pigs*** and your **Unit Dictionary** to help you.

Term	My Definition	Unit Dictionary Definition
Biome		
Chaparral		
Feral		

Name: _____

Term	My Definition	Unit Dictionary Definition
Introduced species		
Omnivore		
Savanna		

A Tale of Feral Pigs: Part 1

By the end of the 1700s, Spanish settlers were bringing European plants and animals to their new farms and ranches in California. One of the animals they brought was the domestic European pig. Ranchers thought pigs would be good to bring because they cost very little to feed. Pigs are omnivores, they eat both plants and animals. California's ranchers had plenty of native oak trees on their properties. Pigs loved the acorns that fell from the oak trees. The oaks provided free food for the ranchers' pigs, and the pigs were a cheap source of food for the ranchers' families. Eventually, some of the pigs pushed through their fences and enjoyed unlimited dining in the wild chaparral of the coastal mountain range. The escaped pigs joined together and ran in large packs.

More than 100 years later, in the 1920s, a business owner named George Gordon Moore brought several wild boars from Germany to North Carolina. He had a hunting preserve in the Smoky Mountains. His friends would come from all over the country to hunt the wild boars. "You can never tell whether [the boars] will run away from you or run at you," Moore said. He decided to bring some of the strongest boars to his ranch in Carmel, California. He wanted his friends to be able to hunt the wild animals year-round.

The boars, too, escaped. When they met the packs of escaped European pigs, their genes mixed with the pigs' genes and produced what

Feral pig

Australian Savanna

some people in California now see as a resource, and most see as a non-native pest: feral pigs. ("Feral" describes an animal that was once domesticated but is now wild.) Feral pigs have thick, bristly coats and cloven feet, similar to deer. They sometimes have a mane of rigid hair on their backs, with short, straight tails. Male feral pigs, also called boars, have tusks that are three-to-five inches long. Females are smaller and do not have tusks.

Halfway around the world, settlers brought domestic pigs from England to Australia. They traveled in the late 1700s on the ships of the First Fleet. The First Fleet was a group of British ships that brought prisoners to Botany Bay, near what is now Sydney. These prisoners started the first European town in Australia. Some of the pigs that came with the Fleet escaped from Australian ranches, just as pigs had escaped in California. The feral pigs lived well in the wild savanna of northern Australia.

The chaparral and the savanna are both biological regions (biomes) that are especially good places for feral pigs to live. Chaparral has many shrubs and scrub oak. It is found along California's coast, on the slopes of Southern California's mountains, and on the western foothills of the Sierra Nevada. In the Australian savanna, thick grasses and scattered trees grow. The weather is hot and dry in the summer and rainy and mild in the winter. Both biomes have dry seasons that can last for five to seven months. When the rainy season comes, many streams and rivers overflow their banks and erode the land.

Name: _____

Directions: Complete the timeline with the information in the story ***A Tale of Feral Pigs.***

What Happened?	When?

Pigs living in the wild in California are _____.

Pigs and boars brought to California from Europe escaped into California's _____ in the Coastal Mountain Range.

Name: _____

Directions: Complete the timeline with the information in the story ***A Tale of Feral Pigs.***

What Happened?	**When?**

As in California, feral pigs in Australia are _____, which means they eat both plants and animals.

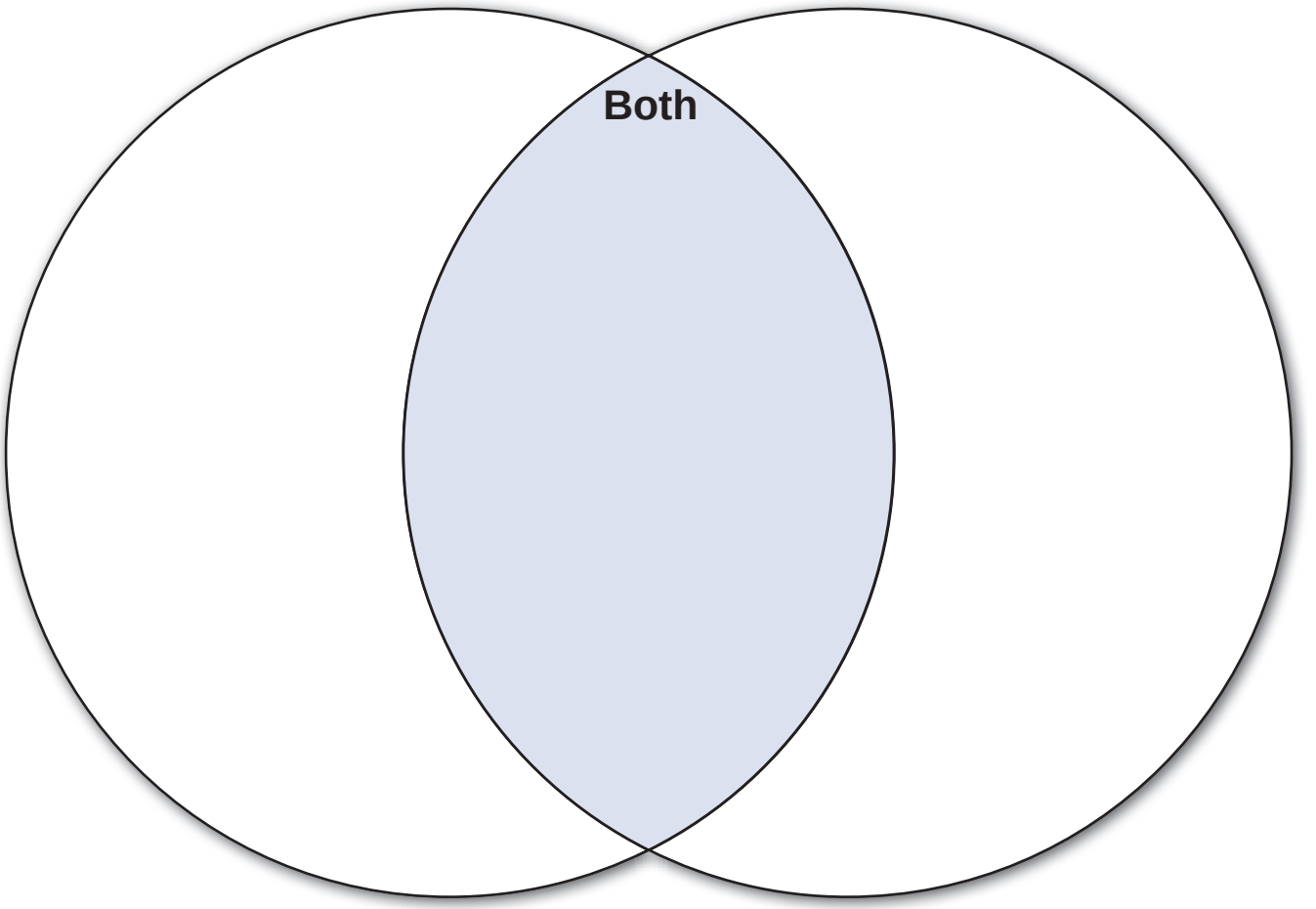
Pigs brought to northern Australia from Europe escaped into the _____, a good environment for feral pigs.

Name: _____

Directions: Use ***California Connections: A Tale of Feral Pigs—Part 1*** and your **Unit Dictionary** to list features of the chaparral and savanna biomes. List at least two things that describe only chaparral in the left circle. List at least two things that describe only savanna in the right circle. List at least two things that are true for both biomes in the middle area where the circles overlap. Try to list 10 features.

Chaparral

Savanna



Chaparral Biome Range Map

Savanna Biome Range Map

Name: _____

Each of the world's nine biomes can be described by its climate and vegetation. Climate is the long-term weather pattern for a region. Temperature and precipitation (rain, snow, and sleet) are two ways to describe climate. Climatograms show temperature and precipitation on the same graph and provide a picture of a biome's climate.

Procedure

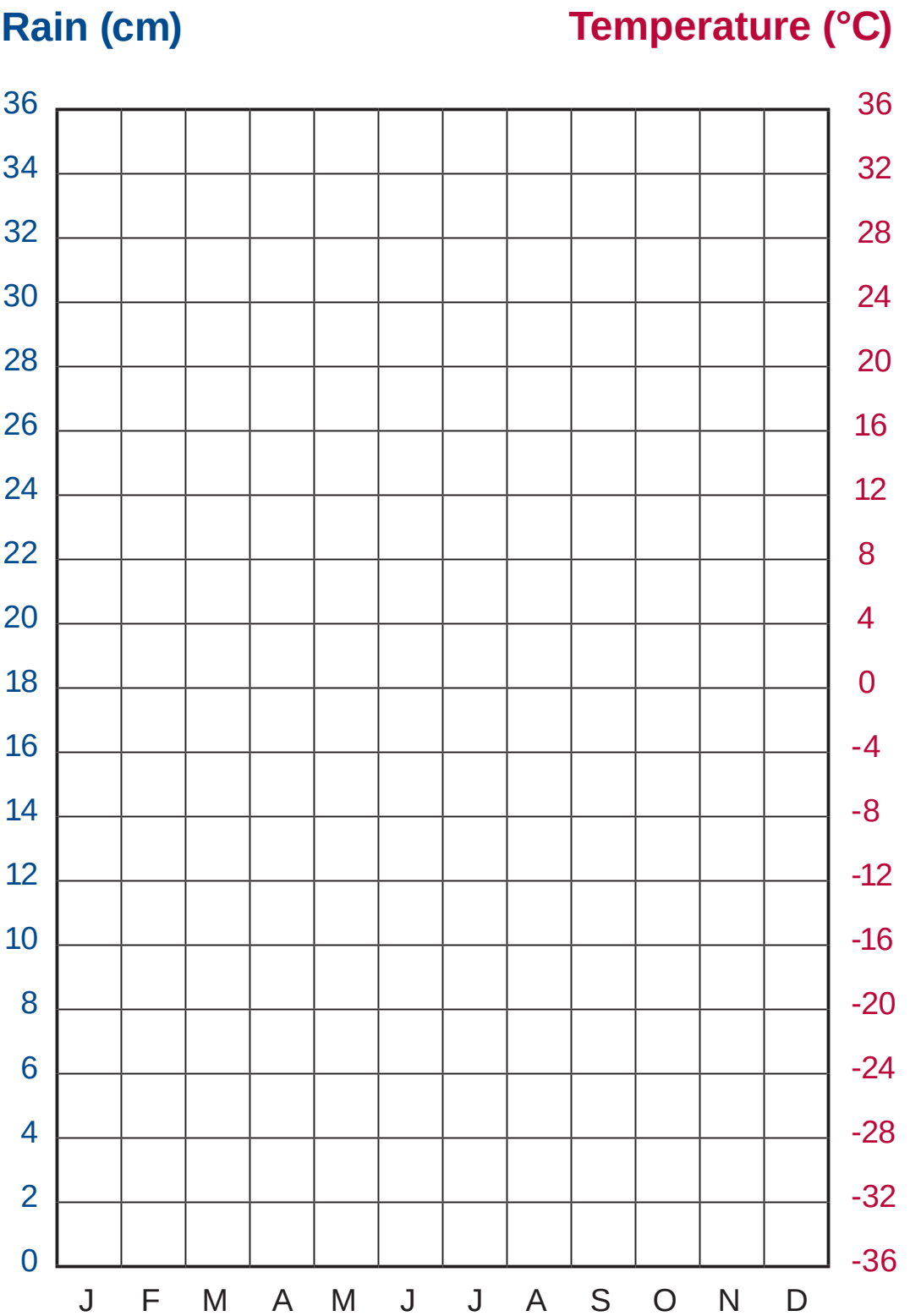
1. Find your team number on the **Mystery Biome Data Sheet**. Using the data for your team's mystery biome, plot the numbers for monthly temperature with dots. The scale for temperature is on the right side of the climatogram. Connect the dots to make a line graph. Then, with a second color, use the numbers for precipitation to plot a bar graph. The scale for precipitation is on the left side of the climatogram. Each team member should create their own climatogram.

2. Review the nine **Biome Cards** and use your chart to figure out which biome matches your data. Read the descriptions on the cards for clues.

3. Post one of your group's climatograms and the correct **Biome Card** on the wall near the map of **World Biomes**. Use a piece of string to connect your biome description card and climatogram to a spot in your biome's range on the map.

Name: _____

Climatogram: Mystery Biome _____



Name: _____

Mystery Biome #1: _____

	J	F	M	A	M	J	J	A	S	O	N	D
Temp (°C)	-20.0	-18.9	-12.2	-2.2	5.6	12.2	16.1	15.0	10.6	3.9	-5.6	-15.0
Precip (cm)	3.3	2.3	2.8	2.5	4.6	5.6	6.1	8.4	7.4	4.6	2.8	2.0

Mystery Biome #2: _____

	J	F	M	A	M	J	J	A	S	O	N	D
Temp (°C)	7.5	10.6	13.5	17.8	23.3	29.3	32.8	31.5	26.9	20.1	12.7	7.6
Precip (cm)	1.4	1.2	1.3	0.5	0.5	0.3	0.9	1.3	0.7	0.6	1.1	1.0

Mystery Biome #3: _____

	J	F	M	A	M	J	J	A	S	O	N	D
Temp (°C)	25.6	25.6	24.4	25.0	24.4	23.3	23.3	24.4	24.4	25.0	25.6	25.6
Precip (cm)	25.8	24.9	31.0	16.5	25.4	18.8	16.8	11.7	22.1	18.3	21.3	29.2

Mystery Biome #4: _____

	J	F	M	A	M	J	J	A	S	O	N	D
Temp (°C)	-25.8	-27.8	-26.0	-18.2	-7.2	1.0	4.1	5.0	3.3	-0.8	-9.2	-18.1
Precip (cm)	0.4	0.4	0.3	0.4	0.3	0.8	2.2	2.3	1.5	1.3	0.6	0.5

Mystery Biome #5: _____

	J	F	M	A	M	J	J	A	S	O	N	D
Temp (°C)	18.1	19.0	19.0	18.2	17.2	16.0	15.3	15.3	16.8	17.8	17.5	17.4
Precip (cm)	5.6	5.0	7.7	19.8	15.9	4.0	1.5	1.9	2.6	5.0	12.9	8.5

Name: _____

Mystery Biome #6: _____

	J	F	M	A	M	J	J	A	S	O	N	D
Temp (°C)	-6.1	-3.7	2.9	9.2	14.9	20.3	22.9	22.1	18.0	17.1	4.4	-3.0
Precip (cm)	3.8	3.4	6.7	9.1	8.3	9.45	9.2	10.6	9.6	6.0	7.3	6.2

Mystery Biome #7: _____

	J	F	M	A	M	J	J	A	S	O	N	D
Temp (°C)	11.7	11.7	12.8	14.4	15.6	17.2	18.9	18.3	18.3	16.7	14.4	12.8
Precip (cm)	8.9	7.6	7.4	1.3	1.3	0	0	0	0.3	1.5	3.6	5.8

Mystery Biome #8: _____

	J	F	M	A	M	J	J	A	S	O	N	D
Temp (°C)	5.8	6.0	10.0	16.0	21.8	25.1	27.8	25.6	22.3	18.0	10.8	6.5
Precip (cm)	12.5	10.0	13.3	9.3	9.7	8.0	10.1	8.3	6.5	6.1	8.4	10.5

Mystery Biome #9: _____

	J	F	M	A	M	J	J	A	S	O	N	D
Temp (°C)	11.1	10.9	8.6	4.8	1.7	1.3	-2.6	-1.7	0.4	4.1	7.0	9.4
Precip (cm)	1.5	1.4	1.5	1.8	2.1	2.1	2.1	2.4	2.1	2.7	2.1	1.7

Name: _____

Part 1

Fill in the location and the climate boxes for each of the biomes listed. Use the **Unit Dictionary**, the classroom posters, and the Internet if it is available to help you. List two or more points in each box.

Part 2

As groups give their presentations, take notes and fill in the typical vegetation and plant characteristics boxes. List two or more points in each box. You may also add information to the location and climate boxes if you learn something new.

Name: _____

	Chaparral	Savanna	Grassland
Location			
Climate			
Typical Vegetation			
Plant Characteristics			

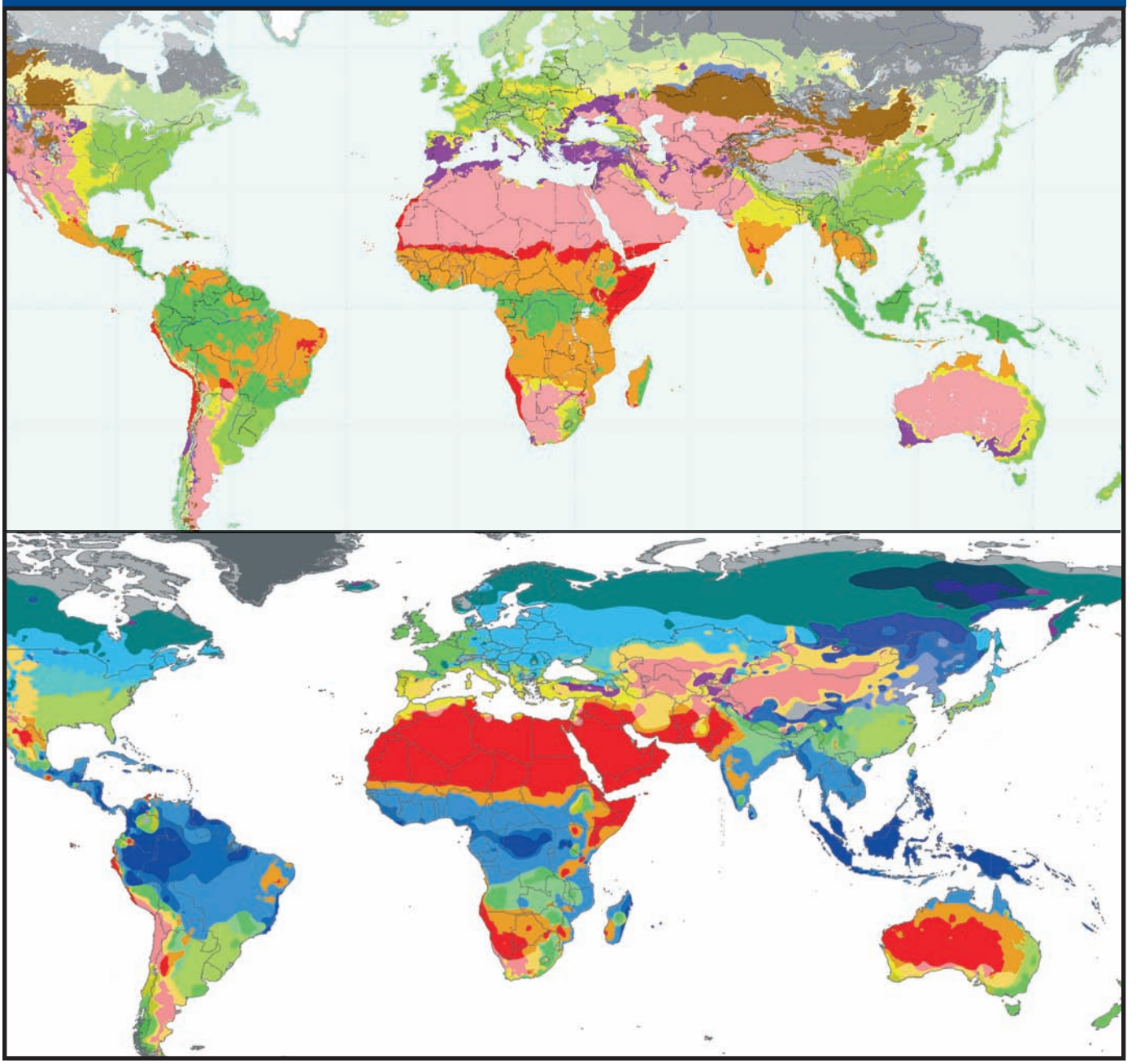
Name: _____

	Desert	Rainforest	Deciduous Forest
Location			
Climate			
Typical Vegetation			
Plant Characteristics			

Name: _____

	Location	Climate	Typical Vegetation	Plant Characteristics
Alpine				
Tundra/polar				
Taiga (Coniferous Forest)				

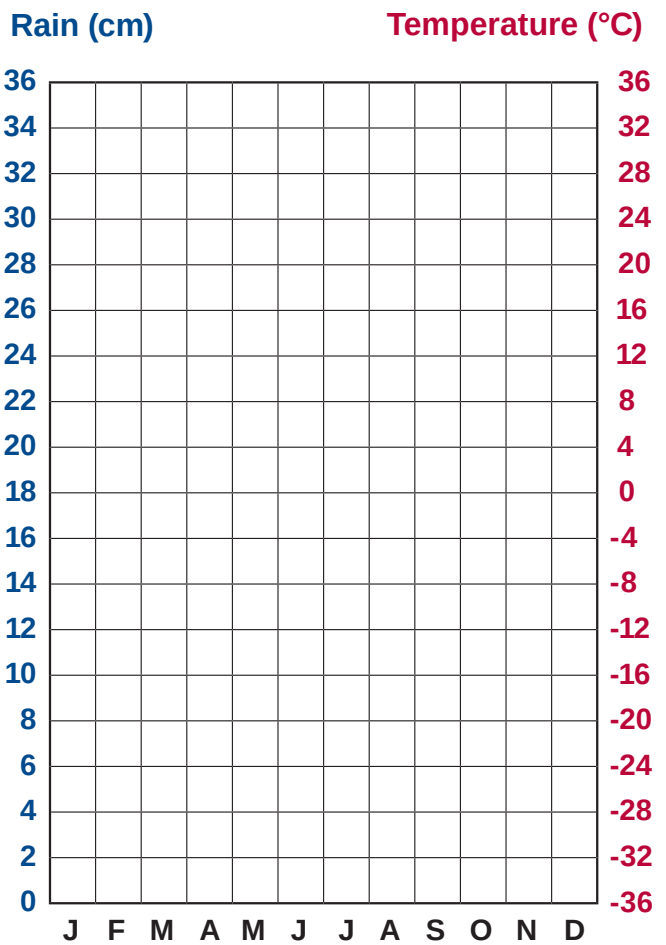
World Biomes and Climates



Climatogram: Poway, California

Average Monthly Temperature and Average Monthly Precipitation Data for Poway, California

	J	F	M	A	M	J	J	A	S	O	N	D
Temp (°C)	12.0	14.0	14.5	16.0	19.0	21.0	25.0	26.0	22.5	20.0	15.0	12.0
Precip (cm)	9.7	7.2	7.0	2.8	.1	.01	.05	.5	.1	1.3	5.3	5.5



Chaparral

Location: Found in scattered patches in hilly coastal areas in the middle latitudes.

Climate: Mild, wet winters and hot, dry summers.

Savanna

Location: Tropical, located between rainforests or woodlands and grasslands or desert.

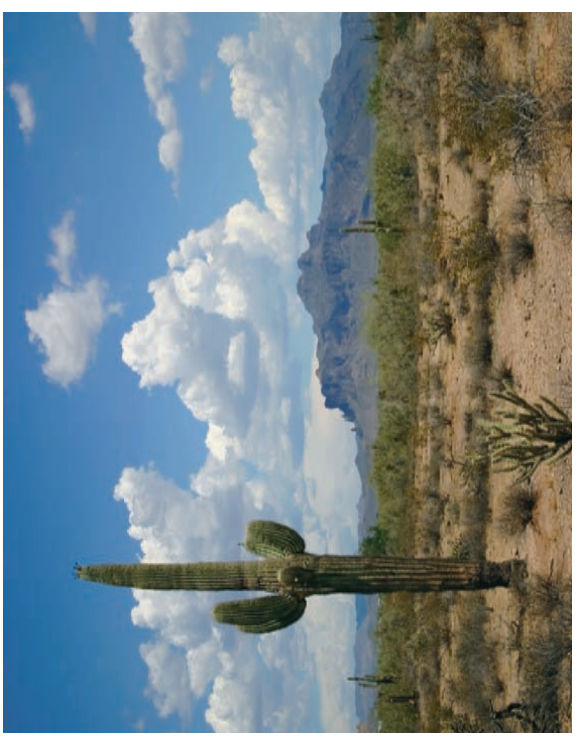
Climate: Very warm with distinct wet and dry seasons; extreme changes in precipitation.

Rainforest

Location: Tropical rainforests are found in a band along the equator, while temperate rainforests are found along coastlines.

Climate: Both tropical and temperate rainforests are warm and very humid with high rainfall that is usually heavier during a particular part of the year.

Desert



Location: Wide range, in tropical, subtropical, and temperate latitudes.

Climate: Very dry—average annual rainfall of 10 inches or less. Some are hot and dry while others are cold and dry.

Deciduous Forest

Location: Middle latitudes.

Climate: Seasonal temperature changes and moderate precipitation that is spread evenly through the year.

Taiga (Coniferous Forest)

Location: Covers most of inland Alaska, Canada (parts are called boreal forest), Northern Europe, and Russia (especially Siberia). The world's largest land-based biome.

Climate: Very large temperature change between summer and winter. Summers are short and humid, while winters are long and very cold. Low levels of precipitation, mostly in summer.

Grassland

Location: In the interior of continents at middle latitudes.

Climate: Seasonal, with great differences in temperature between winter and summer. Moderate precipitation, heaviest in the spring.

Alpine

Location: At very high altitude (tall mountains and mountain ranges) at any latitude.

Climate: Very similar to tundra. Extremely cold and windy, with soils permanently frozen for much of the year at the highest elevations. Little precipitation.

Tundra/Polar

Location: Arctic region, north of the taiga biome, and the Antarctic region.

Climate: Extremely cold, frozen for much of the year, and dry. Two seasons: winter and summer. In summer, the upper layer of the frozen ground defrosts and marshes, lakes, and streams cover the land. There are, in effect, two layers of soil.

Manzanita

Manzanita is a common shrub in the chaparral biome. Its leaves are small and thick. This helps reduce the amount of water lost from the leaves through evaporation. This is particularly important during the dry summer months typical of this biome.

Biome: Chaparral

Typical Vegetation: Shrubs that grow close together.

Plant Characteristics: Most chaparral plants have small, thick leaves. Small leaves do not lose as much water through evaporation as do large leaves. Sometimes the leaves of chaparral plants have a waxy coating or small hairs that also help prevent water loss. Some chaparral plants have shallow roots that grow wide around the plant to capture the limited rain that reaches the ground. Others have long taproots that grow straight down to the groundwater stored deep below the surface. Fires are common in the chaparral. If a fire burns the top of the plant, some plants in this biome can grow back quickly from woody growths at their base. The seeds of many chaparral plants grow only after a fire heats them.

Jarrah Tree

Jarrah trees grow in the Australian savanna. They often have large swellings near the base of the plant, at or just below ground level. These swellings are called "lignotubers." If a fire burns the part of the plant that is above ground, new shoots can grow from the lignotuber. This helps the plant survive fires, which are common in the hot, dry savanna climate.

Biome: Savanna

Typical Vegetation: Grasses with scattered trees and shrubs.

Plant Characteristics: Some savanna plants shed their leaves during the savanna biome's long dry season. As a result, these plants do not lose precious water through evaporation from their leaf surfaces. Many savanna plants have leathery leaves, which limit water loss by keeping the plant cooler. Leaves may hang down so not much surface is hit by sunlight. This, too, helps keep the leaves cool and prevents water loss. Many savanna plants have shallow roots to capture rainwater. Others have long taproots that grow straight down, deep into the soil. During dry periods, these roots help savanna plants find water that is stored deep below the surface. Like the jarrah tree, some plants in the savanna have lignotubers below the ground that help them grow back after a fire.

Buffalo Grass

Buffalo grass is a common grass of the North American prairies. It has several features that help it live in the variable climate of the grassland biome. Buffalo grass can withstand drought, heat, and cold. In times of little rainfall, it dries out and becomes dormant. It has thin, shallow roots to take up as much water as possible when it does rain. Its underground root system keeps the plant alive in winter, even as the aboveground grasses die. Buffalo grass seeds are protected from fires by burrs—prickly seed cases.

Biome: Grassland

Typical Vegetation: Grasses and forbs (herbs), very few trees or shrubs

Plant Characteristics: Grassland biomes generally have hot, dry summers and cold, snowy winters. Extensive root systems help grassland plants live with these varied conditions. The aboveground parts of the plants die in winter, but a vast underground network of roots, bulbs, and other structures keeps the plants alive. The root systems of grassland plants can be longer than the plants are tall. This underground network helps the plants store water, obtain nutrients, and survive fires. Fires are common in the grasslands. Because there are not a lot of large, woody plants, fires tend to burn quickly and not cause much damage to the soil. They remove dead grasses on the surface, making way for spring species to grow. Many of the seeds are protected from fires by their thick seeds cases. Some survive long periods underground until conditions are right for them to sprout.

Saguaro Cactus

The saguaro cactus is found in the deserts of Southern California, Arizona, and northern Mexico. Saguaros have very tall, thick stems. The fleshy pulp inside the stem can expand like an accordion. This helps the saguaro store water when it is available. A waxy skin covers the stem and helps prevent water from evaporating from its surface. The spines on the stem keep animals from eating the cactus. Spines also help the saguaro prevent water loss.

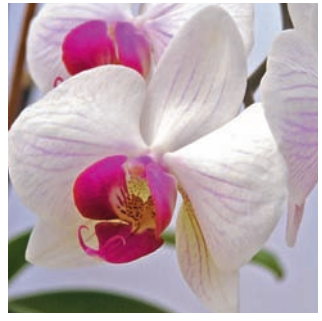
Biome: Desert

Typical Vegetation: Low, scattered bushes and shrubs, some small trees, wildflowers, and cacti (in North and South America.

Plant Characteristics: Desert plants live in a very dry environment. Because there is little rainfall, these plants must be able to store and conserve water. They often have small leaves or spines. This prevents water loss through evaporation from leaf surfaces. Many have spines, which shade the plant and help keep it cool. Spikes also keep animals away from the plants. In long periods of dry weather, many desert plants shut down their life functions. This is called going “dormant.” Dormant plants can spring to life when water becomes available.

Many desert plants have shallow roots that spread out near the ground surface. This helps them collect rainwater when it falls. Other desert plants have one long, straight taproot that reaches deep sources of water. Desert plant seeds are hardy. They can survive underground for a long time. They only sprout when conditions are right and water is available. They grow quickly to take advantage of the water supply.

Orchid



Many kinds of orchids grow in the tropical rainforest biome. About 70 percent of them are epiphytes. Epiphytes are plants that grow high in the forest canopy, where there is plenty of sunlight. Epiphytes get their nutrients directly from the air, falling rain, and bits of leaf litter. Their roots do not touch the forest floor.

Orchid roots have a large surface area. This helps the plant absorb nutrients and water quickly. Many have a bucket-like shape that also helps collect water and food. Their stems store water so they can survive dry periods. Orchids produce a huge number of tiny seeds that a wind can easily carry. If not for this important feature, few orchid seeds would reach the forest floor.

Biome: Rainforest

Typical Vegetation: Very tall trees with high branches, many vines and epiphytic ferns and flowering plants in the trees; large-leaved plants and seedlings on the forest floor.

Plant Characteristics: Rainforest trees grow very tall and straight to compete for sunlight. The higher they reach, the more sunlight they can capture. The leaves on the high branches are small, dark, and leathery to reduce water loss. They have grooves and drip tips so that water rolls off easily. This keeps the leaves from rotting in the wet climate. There are many epiphytes—vines and flowering plants growing high in the leafy branches. Some “strangler” vines use the trees as support. Many of the tall trees have broad bases for extra support in the damp soil. The forest floor is shaded and dark. Most plants on the ground have large leaves to capture as much sunlight as possible.

White Oak Tree

White oaks are among the most common trees in deciduous forests in the eastern United States. They have large leaves to help efficiently gather the Sun’s energy when days start getting longer in spring. In the fall, white oaks—and all deciduous plants—drop their leaves to protect the tree from the coming winter. Cold temperatures could damage the thin, flat leaves. White oak leaves change color in the fall when the leaves stop making a chemical called chlorophyll. Chlorophyll is needed for photosynthesis. It is also what makes leaves green. When the tree stops producing chlorophyll, the yellow, orange, and red colors can be seen before the leaves drop off.

Biome: Deciduous Forest

Typical Vegetation: Large trees that lose their leaves in fall, smaller trees, shrubs, ferns, mosses, and lichen.

Plant Characteristics: The climate in the deciduous forest biome usually is not too cold or too hot. Because of this, many different plants can live in this biome. The plants must be able to survive four distinct seasons: spring, summer, fall, and winter. During the cold winter, little water is present, so the trees protect themselves from losing too much water by dropping their leaves in the fall. Losing their leaves also protects the trees from damage by the cold temperature. The leaves grow back in spring as the days lengthen and water and nutrients become available.

Deciduous trees grow tall to capture the sunlight. Their branches spread wide to collect sunlight for photosynthesis. Their wide root systems collect water and nutrients from the area around their trunks.

Siberian Spruce

The Siberian spruce is one of many conifers of the taiga biome. Conifers are trees with needle-like leaves and seeds that develop in cones. They are evergreen trees; they keep their leaves throughout the year. The spruce's leaves have a waxy coating that is waterproof. The narrow leaves also limit the amount of water lost through evaporation. These characteristics are important during the winter, when the taiga ground freezes and the tree's roots cannot get water. The branches of the Siberian spruce droop a little. This gives the tree a cone-like shape, which helps keep snow from building up on the branches. This prevents branches from getting too heavy and breaking off.

Biome: Taiga

Typical Vegetation: Tall conifers; few smaller trees, shrubs, ferns, and mosses on the forest floor.

Plant Characteristics: Taiga plants must survive cold, long winters. They grow and reproduce only during the short summer seasons. Most plants in the taiga biome are conifer trees. Their cone-like shape keeps snow from building up on their branches. In taiga winters, the ground is frozen and little water is available to the trees' roots. Conifers have small, needle-like leaves that prevent water loss. Conifers keep their needles throughout the year. Growing new leaves in spring requires a lot of energy. The soil in the taiga does not contain many nutrients, and the Sun is usually low in the sky in these regions. The resources for plant growth are limited. As soon as temperatures start to warm, the dark green needles absorb sunlight. The trees are ready to photosynthesize and take advantage of the growing season.

Reindeer Moss

Despite its name, reindeer moss is actually lichen. Lichens are made up of fungi and algae growing together on a rock or tree trunk. The fungi support and protect the algae. The algae photosynthesize and produce food for the fungi. The algae and fungi need each other to survive. Lichens can photosynthesize even in low temperatures and low light. They are not easily damaged by frost. With these characteristics, lichens can grow well in the Arctic tundra. When there is not enough water or light, lichen can dry out and go dormant until conditions change. Even after long dormant periods, they can begin to grow again.

Biome: Tundra

Typical Vegetation: Low shrubs, mosses, lichens, liverworts (moss-like plants), and grasses.

Plant Characteristics: Few plants can survive the extreme cold and low light of the tundra/polar biome. No trees live in the tundra/polar. Tundra plants grow close together and low to the ground. This helps them withstand cold temperatures and dry winds. The tundra frequently is covered with snow. Some tundra plants can grow under snow. Tundra plants have small leaves to avoid losing water through evaporation. Most tundra plants are dormant in winter.

There are two layers to the Arctic ground. The permafrost layer is permanently frozen. Neither plant roots nor water can make their way into the permafrost. Therefore, tundra plants have shallow roots. Above the permafrost, the surface layer thaws each summer. Flowering plants grow and reproduce quickly during the short season when the ground is free from ice.

Himalayan Rhododendron

The Himalayan rhododendron grows high in the mountains of Northern India, Bhutan, and Nepal. This evergreen plant has small, leathery leaves. These features help the plant conserve water. The upper side of the leaf is dark green and shiny. This reflects the intense sunlight of the high mountain elevations and slows evaporation from the leaves. The rhododendron grows very quickly during the alpine biome's short summers.

Biome: Alpine

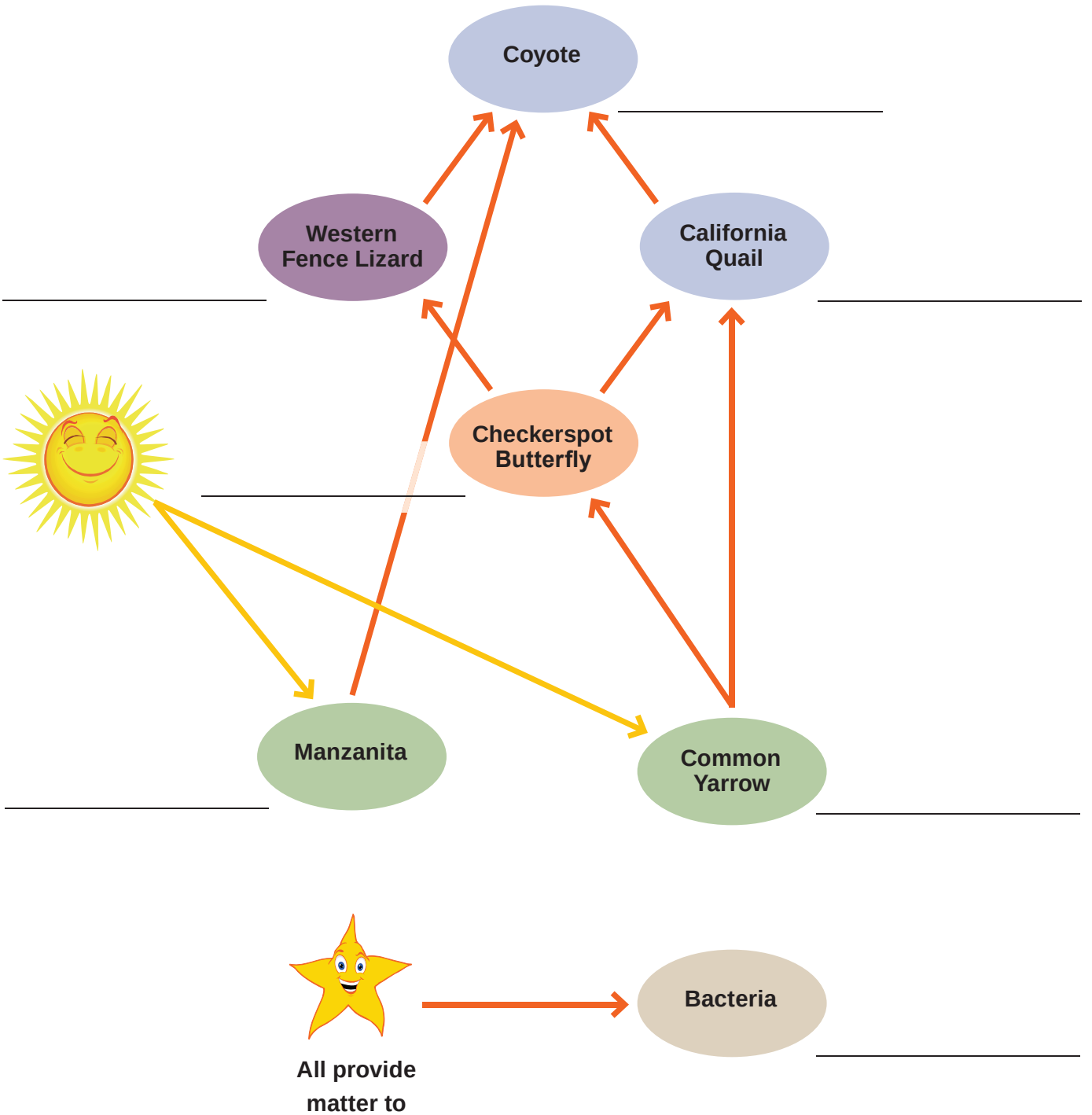
Typical Vegetation: Mostly low-growing plants that live for several years; some evergreen trees at lower elevations; smaller trees and shrubs at higher elevations

Plant Characteristics: Most alpine plants grow low to the ground. This protects them from the strong, cold winds common in this biome. Plants in this biome must also protect themselves from the intense sunlight. Their leaves are thick and small. Many alpine plants have special underground stems that store food during the summer. During the freezing winters, most plants slow or stop their growth. The parts above ground die back, but the underground parts remain alive. This helps the plant survive in its cold, harsh environment. When spring arrives, the plants grow and reproduce quickly, using the food stored in their stems until the soil thaws and roots can absorb water and nutrients.

Name: _____

Ecological Roles in Chaparral Food Web

Identify the ecological role each organism plays in this California chaparral food web.



Name: _____

Use the information on the nine food web charts to answer the following questions.

1. Do all nine biomes have producers? _____

   Provide two examples: _____

   _____

   _____

2. Do all nine biomes have herbivores? _____

   Provide two examples: _____

   _____

   _____

3. Do all nine biomes have omnivores? _____

   Provide two examples: _____

   _____

   _____

4. Do all nine biomes have carnivores? _____

   Provide two examples: _____

   _____

   _____

5. Do all nine biomes have decomposers? _____

   Provide two examples: _____

   _____

   _____

Name: _____

Playing the Same Roles

You have simple food webs for ecosystems in nine biomes. In nature, these food webs have many more relationships than these, but these simple webs show you the ecological roles in all ecosystems: producers, herbivores, omnivores, carnivores, and decomposers.

Organize the information you collected in the table below. Use the organisms from all nine food web diagrams.

	Producers	Herbivores	Omnivores	Carnivores	Decomposers
Chaparral					
Savanna					
Grassland					
Deciduous Forest					

Name: _____

	Producers	Herbivores	Omnivores	Carnivores	Decomposers
Rainforest (Redwood)					
Taiga					
Tundra/Polar					
Alpine					
Desert					

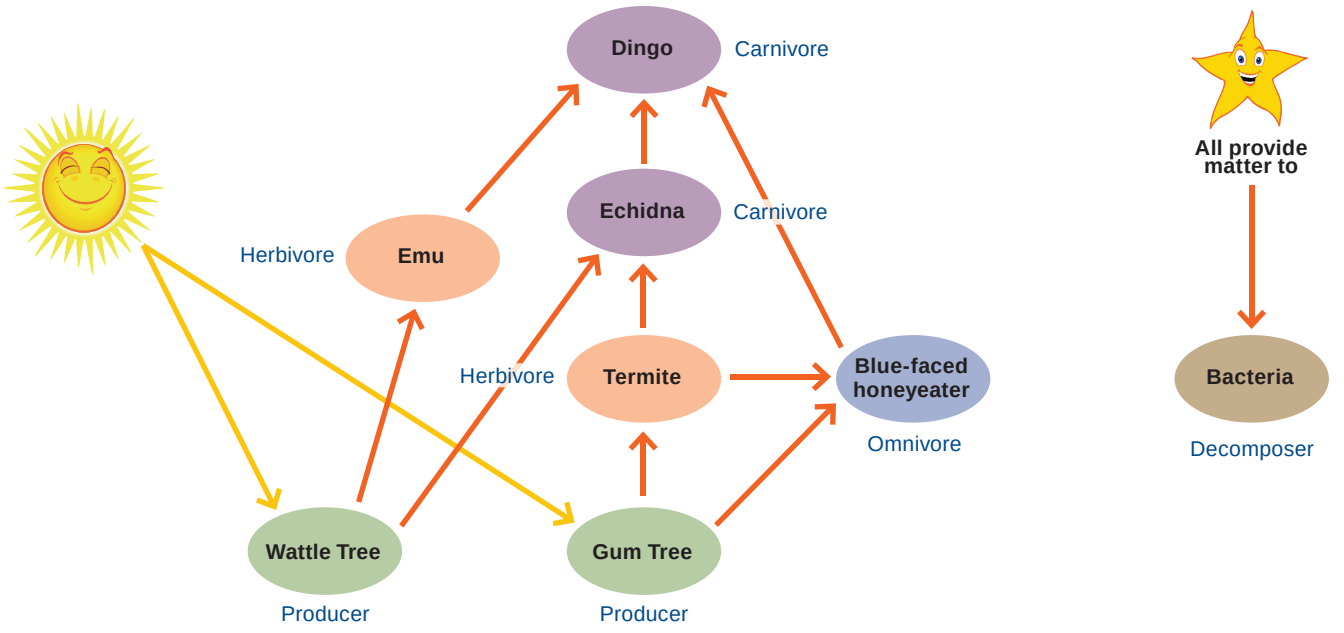
Name: _____

Use the information on pages 1-2 and knowledge of biomes to answer the following questions.

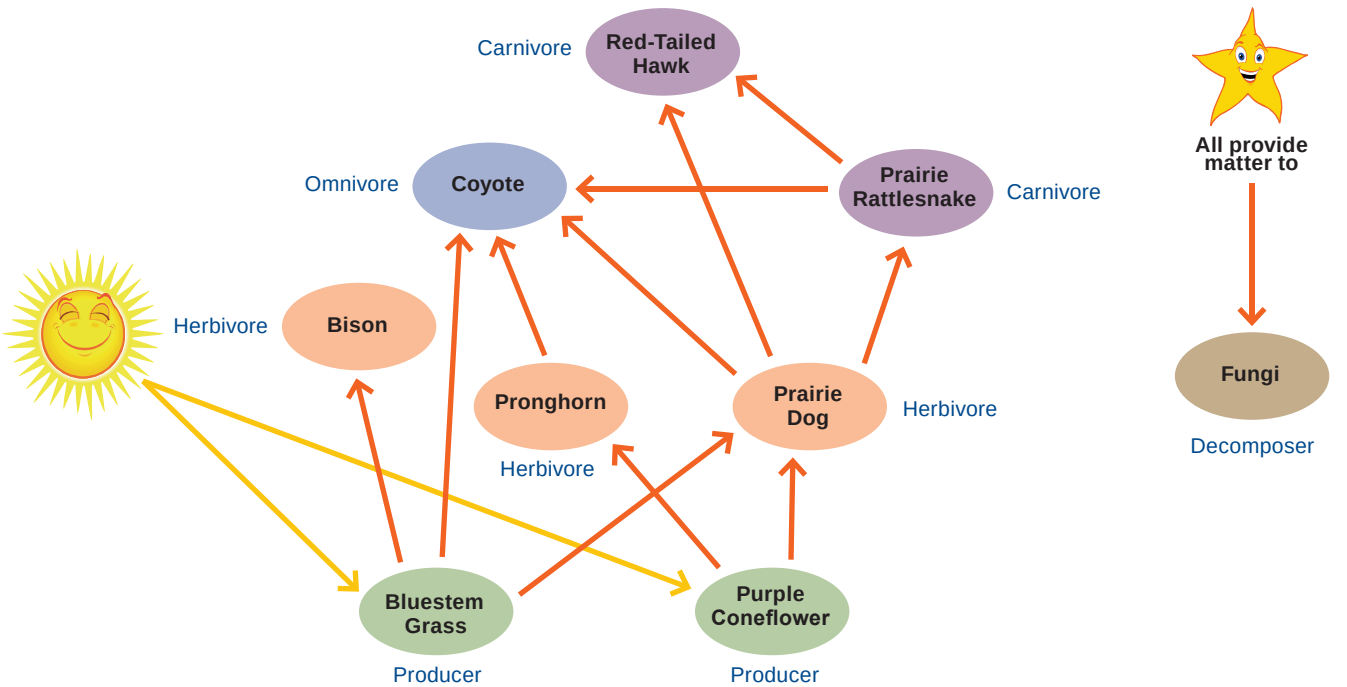
1. Why are different biomes home to different species (different kinds of plants and animals)?

2. How are the ecological roles in different biomes similar and different?

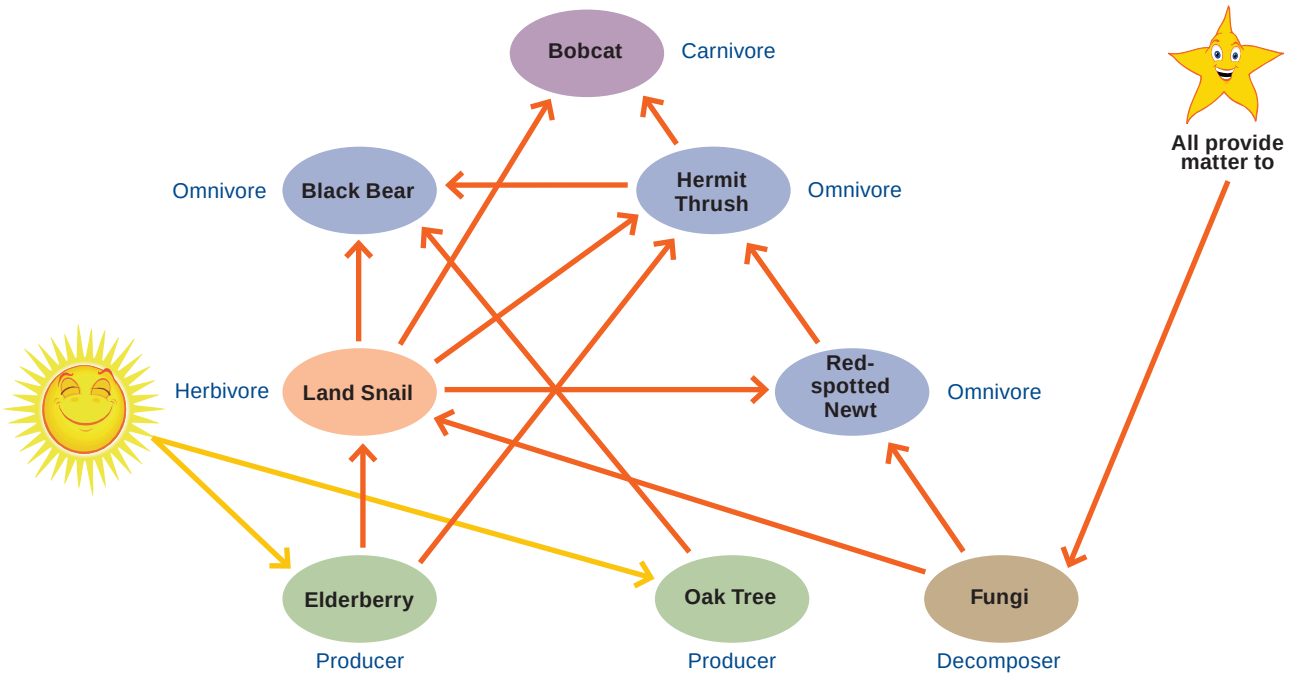
Ecological Roles in a Savanna Food Web



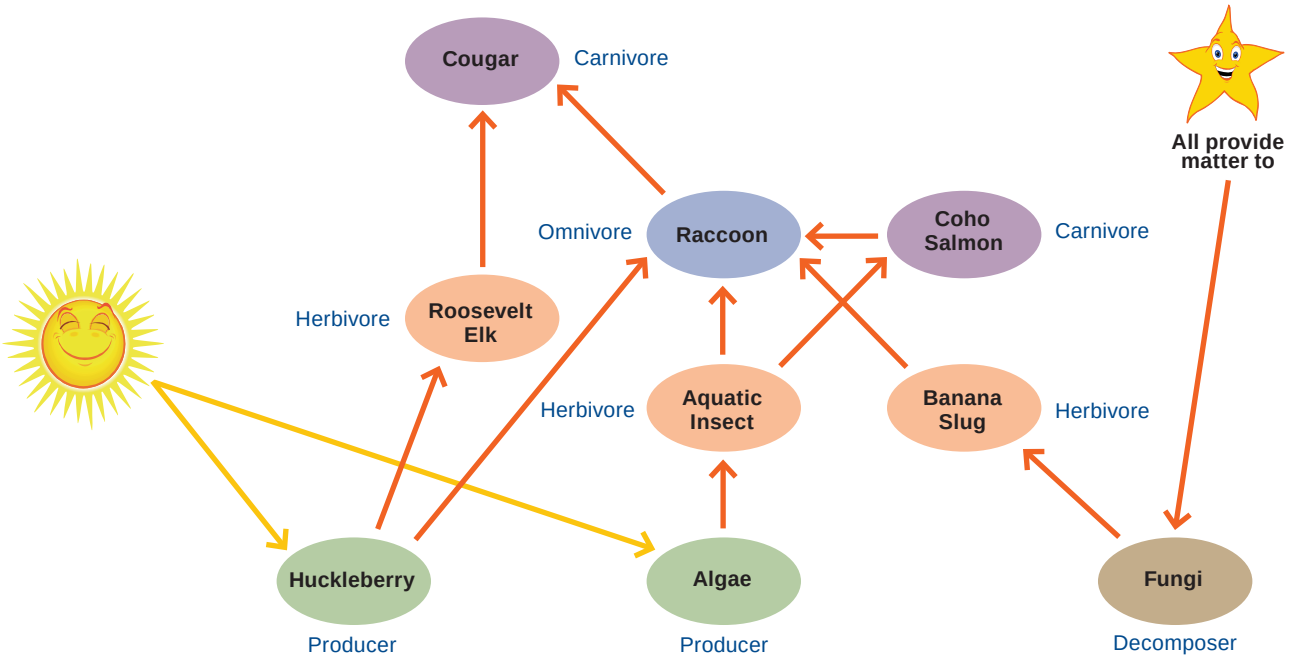
Ecological Roles in a Grassland Food Web



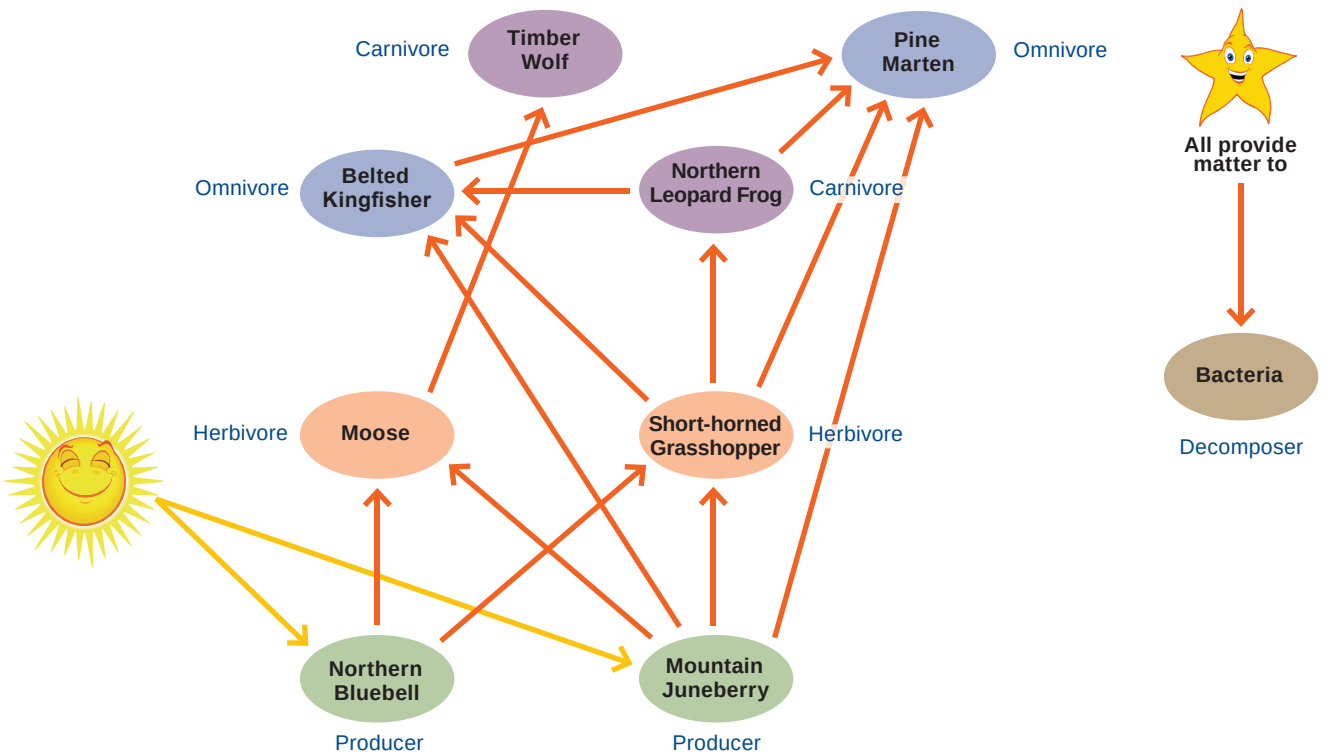
Ecological Roles in a Deciduous Forest Food Web



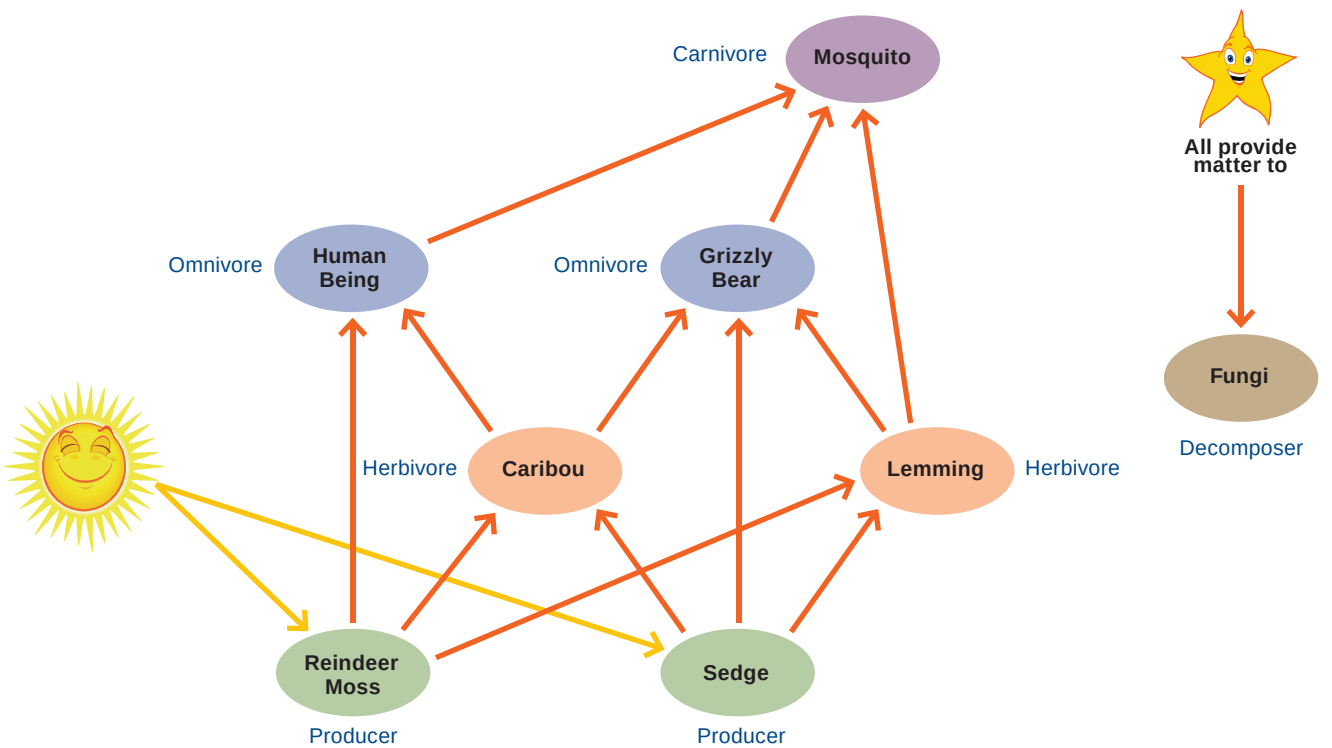
Ecological Roles in a Rainforest (Redwood) Food Web



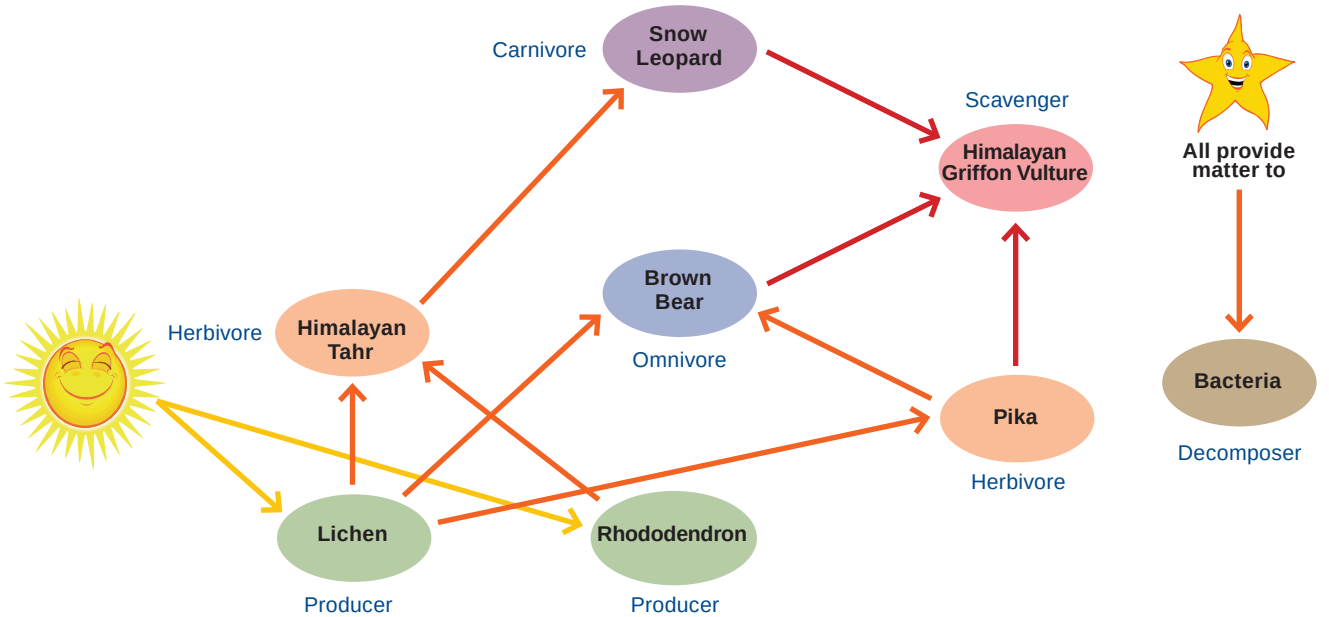
Ecological Roles in a Taiga Food Web



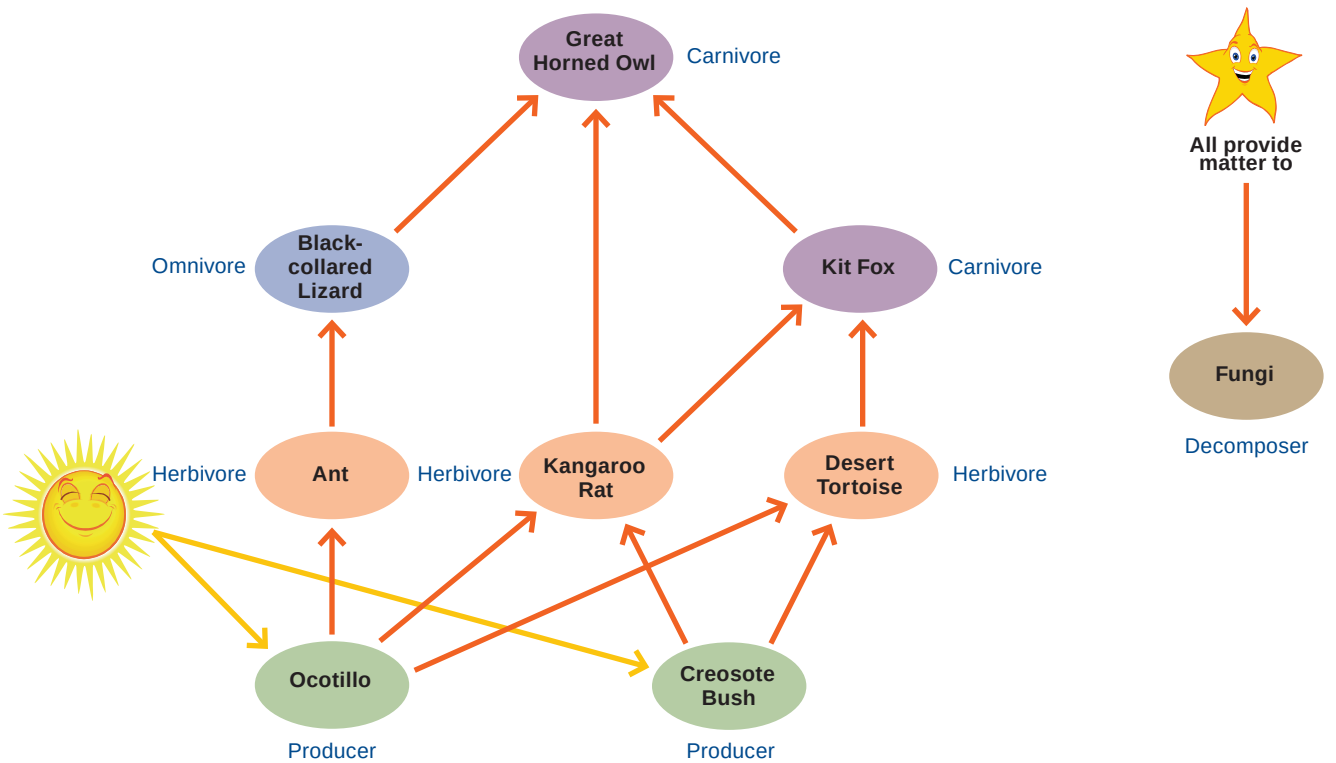
Ecological Roles in a Tundra Food Web



Ecological Roles in an Alpine Food Web



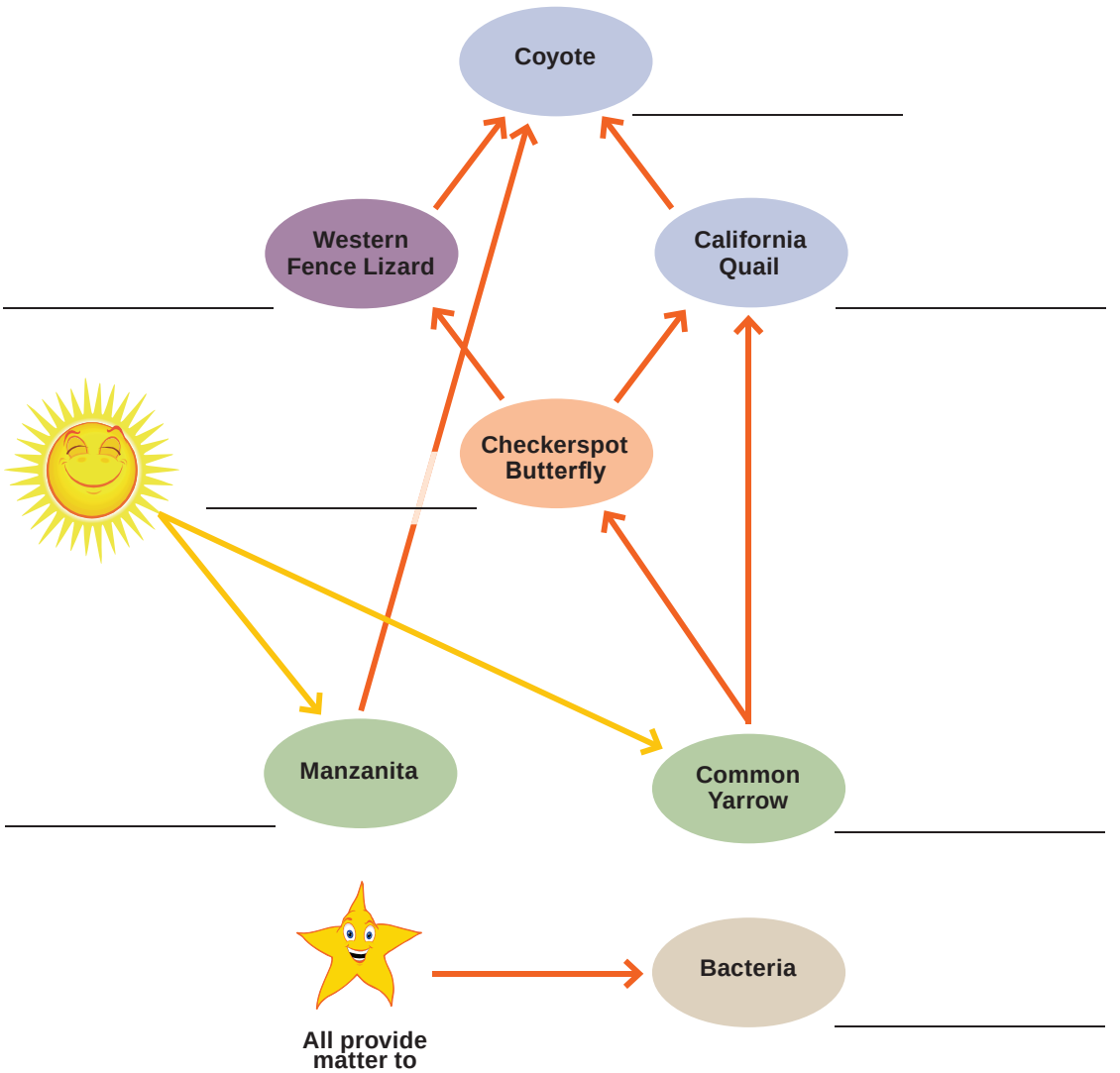
Ecological Roles in a Desert Food Web



Chaparral Food Web

Ecological Roles in Chaparral Food Web

Identify the ecological role each organism plays in this California chaparral food web.



Rainforest Food Web

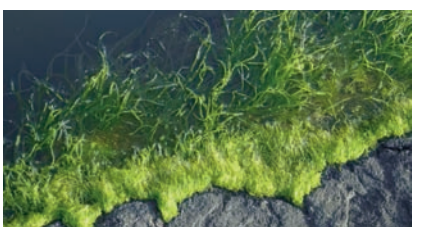
What's My Role?

Huckleberry

Gets energy from: Sunlight

Provides matter and energy to: Raccoon, Roosevelt elk, fungi

Algae



Gets energy from: Sunlight

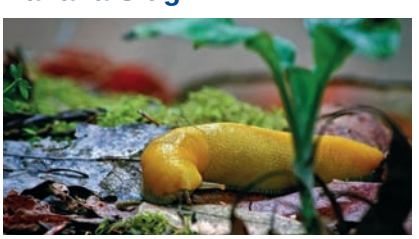
Provides matter and energy to: Aquatic insects, fungi

Fungi

Gets energy from: Decaying plants and animals

Provides matter and energy to: Banana slug

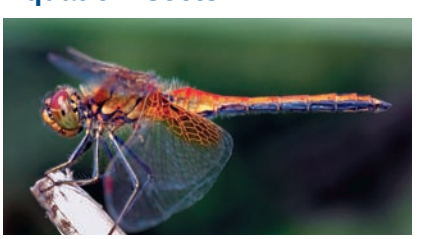
Banana Slug



Gets energy from: Fungi and plants

Provides matter and energy to: Raccoon, fungi

Aquatic Insects



Gets energy from: Algae

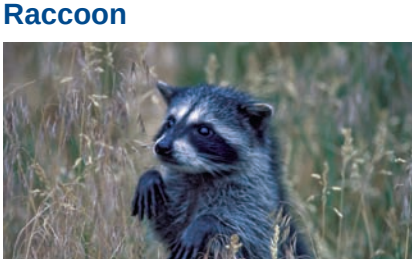
Provides matter and energy to: Raccoon, coho salmon, fungi

Roosevelt Elk

Gets energy from: Huckleberry

Provides matter and energy to: Cougar, fungi

Raccoon



Gets energy from: Huckleberry, aquatic insects, banana slug, coho salmon

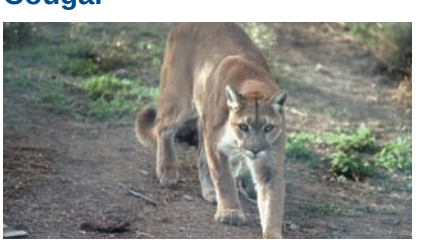
Provides matter and energy to: Cougar, fungi

Coho Salmon (young)

Gets energy from: Aquatic insects

Provides matter and energy to: Raccoon, fungi

Cougar



Gets energy from: Raccoon, Roosevelt elk

Provides matter and energy to: Fungi

Alpine Food Web
What's My Role?

Lichen

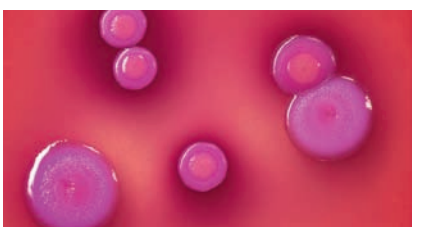

Gets energy from: Sunlight

Provides matter and energy to: Himalayan tahr, brown bear, pika, bacteria

Rhododendron

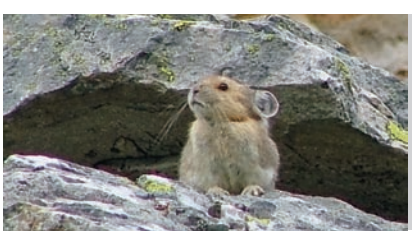

Gets energy from: Sunlight

Provides matter and energy to: Himalayan tahr, bacteria

Bacteria


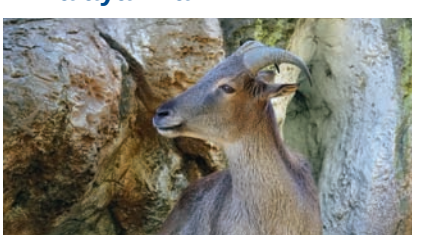
Gets energy from: Decaying plants and animals

Provides matter and energy to: Not shown in this food web

Pika


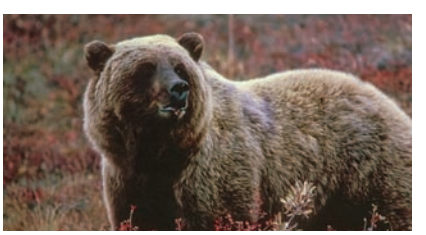
Gets energy from: Lichen

Provides matter and energy to: Brown bear, Himalayan griffon vulture, bacteria

Himalayan Tahr


Gets energy from: Lichen, rhododendron

Provides matter and energy to: Snow leopard, bacteria

Brown Bear


Gets energy from: Lichen, pika

Provides matter and energy to: Himalayan griffon vulture, bacteria

Snow Leopard


Gets energy from: Himalayan tahr

Provides matter and energy to: Himalayan griffon vulture, bacteria

Himalayan Griffon Vulture


Gets energy from: Snow leopard, brown bear, pika

Provides matter and energy to: Bacteria

Deciduous Forest Food Web

What's My Role?

Elderberry

Gets energy from: Sunlight

Provides matter and energy to: Land snail, hermit thrush, fungi

Oak Tree

Gets energy from: Sunlight

Provides matter and energy to: Black bear, fungi

Fungi

Gets energy from: Decaying plants and animals

Provides matter and energy to: Red-spotted newt

Snail

Gets energy from: Elderberry and fungi

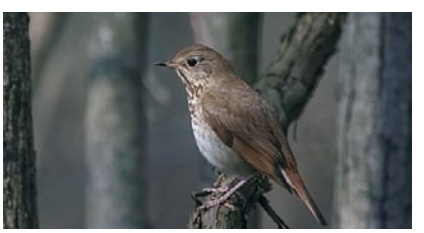
Provides matter and energy to: Black bear and red-spotted newt

Red-spotted Newt

Gets energy from: Fungi, plants, and land snail

Provides matter and energy to: Hermit thrush, fungi

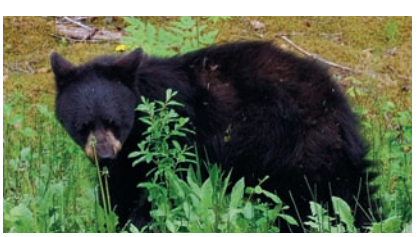
Hermit Thrush



Gets energy from: Red-spotted newt, land snail, elderberry

Provides matter and energy to: Bobcat, black bear, fungi

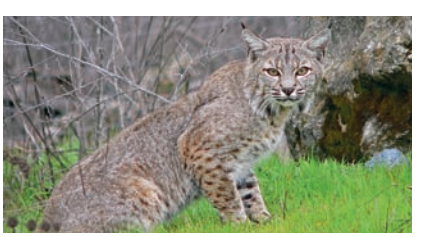
Black Bear



Gets energy from: Land snail, oak tree, hermit thrush

Provides matter and energy to: Fungi

Bobcat



Gets energy from: Land snail, hermit thrush

Provides matter and energy to: Fungi

Savanna Food Web
What's My Role?

Wattle Tree

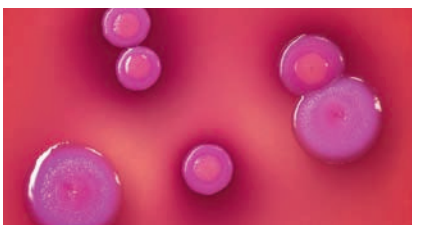

Gets energy from: Sunlight

Provides matter and energy to: Emu, echidna, bacteria

Gum Tree


Gets energy from: Sunlight

Provides matter and energy to: Termites, blue-faced honeyeater, bacteria

Bacteria


Gets energy from: Decaying plants and animals

Provides matter and energy to: Not shown in this food web

Emu


Gets energy from: Wattle tree

Provides matter and energy to: Dingo, bacteria

Termite

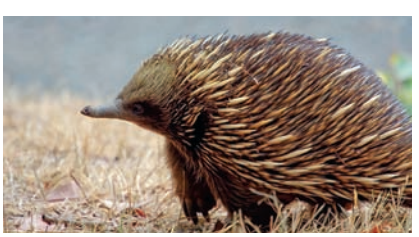

Gets energy from: Gum tree

Provides matter and energy to: Echidna, bacteria, blue-faced honeyeater

Blue-faced Honeyeater

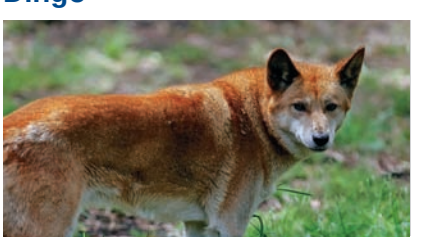

Gets energy from: Gum tree, termites

Provides matter and energy to: Dingo, bacteria

Echidna


Gets energy from: Ants, termites

Provides matter and energy to: Dingo, bacteria

Dingo


Gets energy from: Echidna, emu, blue-faced honeyeater

Provides matter and energy to: Bacteria

Tundra Food Web

What's My Role?

Reindeer Moss

Gets energy from: Sunlight

Provides matter and energy to: Human beings, lemming, caribou, fungi

Sedge

Gets energy from: Sunlight

Provides matter and energy to: Caribou, grizzly bear, lemming, fungi

Fungi

Gets energy from: Decaying plants and animals

Provides matter and energy to: Not shown in this food web

Lemming

Gets energy from: Sedge, reindeer moss

Provides matter and energy to: Grizzly bear, mosquitoes, fungi

Caribou

Gets energy from: Reindeer moss, sedge

Provides matter and energy to: Human beings, grizzly bear, fungi

Grizzly Bear

Gets energy from: Caribou, sedge, lemming

Provides matter and energy to: Mosquitoes, fungi

Mosquitoes

Gets energy from: Human beings, grizzly bear, lemming

Provides matter and energy to: Fungi

Human Beings

Gets energy from: Caribou, reindeer moss

Provides matter and energy to: Mosquitoes, fungi

Desert Food Web
What's My Role?

Ocotillo


Gets energy from: Sunlight

Provides matter and energy to: Ants, kangaroo rat, desert tortoise, fungi

Creosote Bush


Gets energy from: Sunlight

Provides matter and energy to: Kangaroo rat, desert tortoise, fungi

Fungi


Gets energy from: Decaying plants and animals

Provides matter and energy to: Not shown in this food web

Desert Tortoise


Gets energy from: Ocotillo, creosote bush

Provides matter and energy to: kit fox, fungi

Kangaroo Rat


Gets energy from: Ocotillo, creosote bush

Provides matter and energy to: Great horned owl, kit fox, fungi

Ant

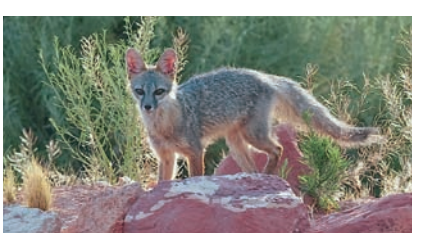

Gets energy from: Ocotillo

Provides matter and energy to: Black-collared lizard, fungi

Black-collared Lizard

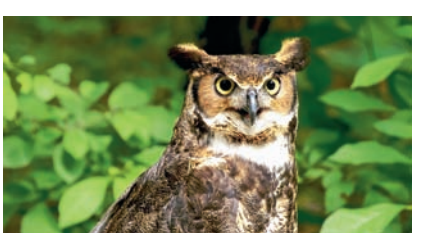

Gets energy from: Ants, flies

Provides matter and energy to: Great horned owl, fungi

Kit Fox


Gets energy from: Kangaroo rat, desert tortoise

Provides matter and energy to: great horned owl, fungi

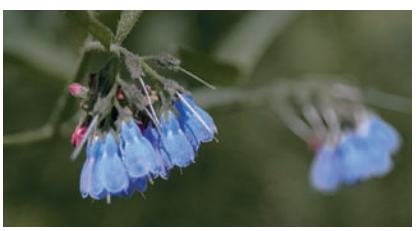
Great Horned Owl


Gets energy from: Black-collared lizard, kangaroo rat, kit fox

Provides matter and energy to: Fungi

Taiga Food Web
What's My Role?

Northern Bluebell



Gets energy from: Sunlight

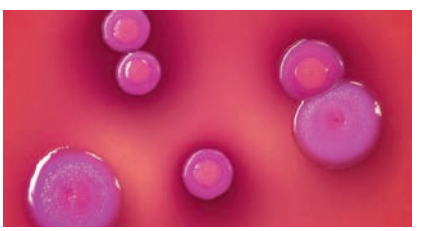
Provides matter and energy to: Moose, short-horned grasshopper, bacteria

Mountain Juneberry

Gets energy from: Sunlight

Provides matter and energy to: Short-horned grasshopper, moose, pine marten, belted kingfisher, bacteria

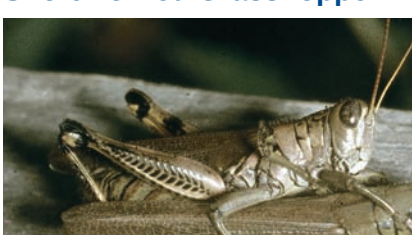
Bacteria



Gets energy from: Decaying plants and animals

Provides matter and energy to: Not shown in this food web

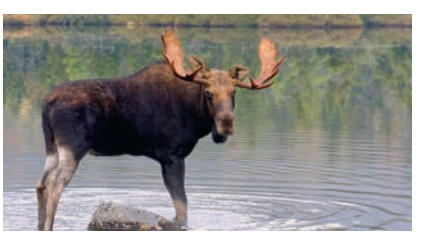
Short-horned Grasshopper



Gets energy from: Northern bluebell, mountain juneberry

Provides matter and energy to: Belted kingfisher, pine marten, leopard frog, bacteria

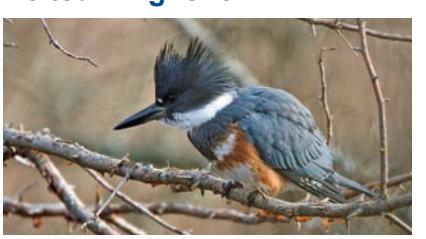
Moose



Gets energy from: Northern bluebell, mountain juneberry

Provides matter and energy to: Timber wolf, bacteria

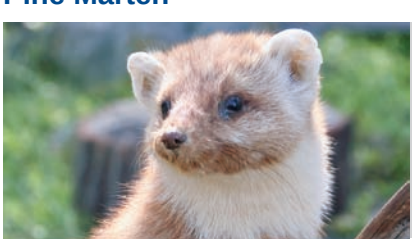
Belted Kingfisher



Gets energy from: Mountain juneberry, short-horned grasshopper, northern leopard frog

Provides matter and energy to: Pine marten, bacteria

Pine Marten



Gets energy from: Mountain juneberry, belted kingfisher, northern leopard frog, short-horned grasshopper

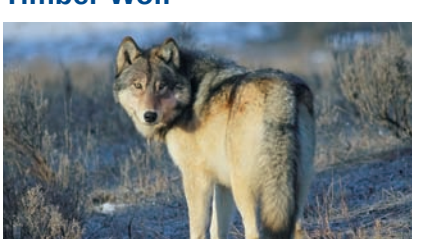
Provides matter and energy to: Bacteria

Northern Leopard Frog

Gets energy from: Short-horned grasshopper

Provides matter and energy to: Pine marten, belted kingfisher, bacteria

Timber Wolf



Gets energy from: Moose

Provides matter and energy to: Bacteria

Grassland Food Web
What's My Role?

Bluestem Grass

Gets energy from: Sunlight

Provides matter and energy to: Bison, prairie dog, fungi

Purple Coneflower

Gets energy from: Sunlight

Provides matter and energy to: Pronghorn, prairie dog, fungi

Fungi

Gets energy from: Decaying plants and animals

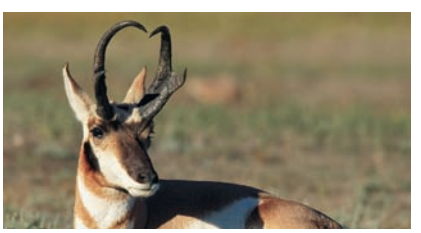
Provides matter and energy to: Not shown in this food web

Prairie Dog

Gets energy from: Bluestem grass, purple coneflower

Provides matter and energy to: Coyote, red-tailed hawk, prairie rattlesnake, fungi

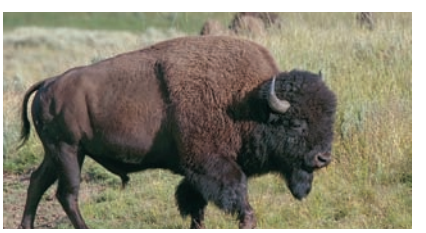
Pronghorn



Gets energy from: Purple coneflower

Provides matter and energy to: Coyote, fungi

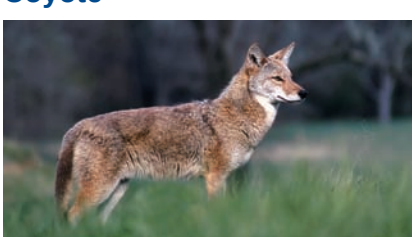
Bison



Gets energy from: Bluestem grass

Provides matter and energy to: Fungi

Coyote



Gets energy from: Pronghorn, prairie dog, prairie rattlesnake, fruiting plants

Provides matter and energy to: Fungi

Prairie Rattlesnake

Gets energy from: Prairie dog

Provides matter and energy to: Coyote, red-tailed hawk, fungi

Red-tailed Hawk

Gets energy from: Prairie dog, prairie rattlesnake

Provides matter and energy to: Fungi

Name: _____

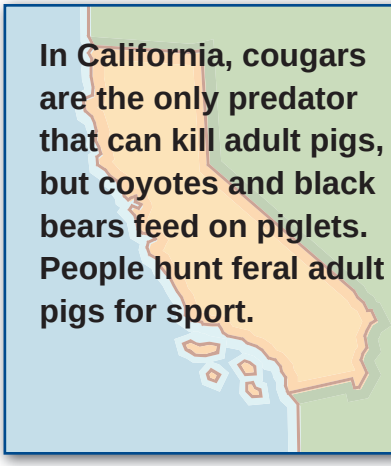
Feral pigs need to drink water every day.

Feral pigs eat many types of foods, including:

- acorns and the seeds of many plants
- the stalks, roots, and bulbs of many plants
- agricultural crops including sugarcane in Australia and vineyard grapes in California
- insects
- lizards and frogs
- ground-nesting baby birds and eggs
- small mammals
- dead animals

Dingos and wild dogs in Australia may eat piglets.

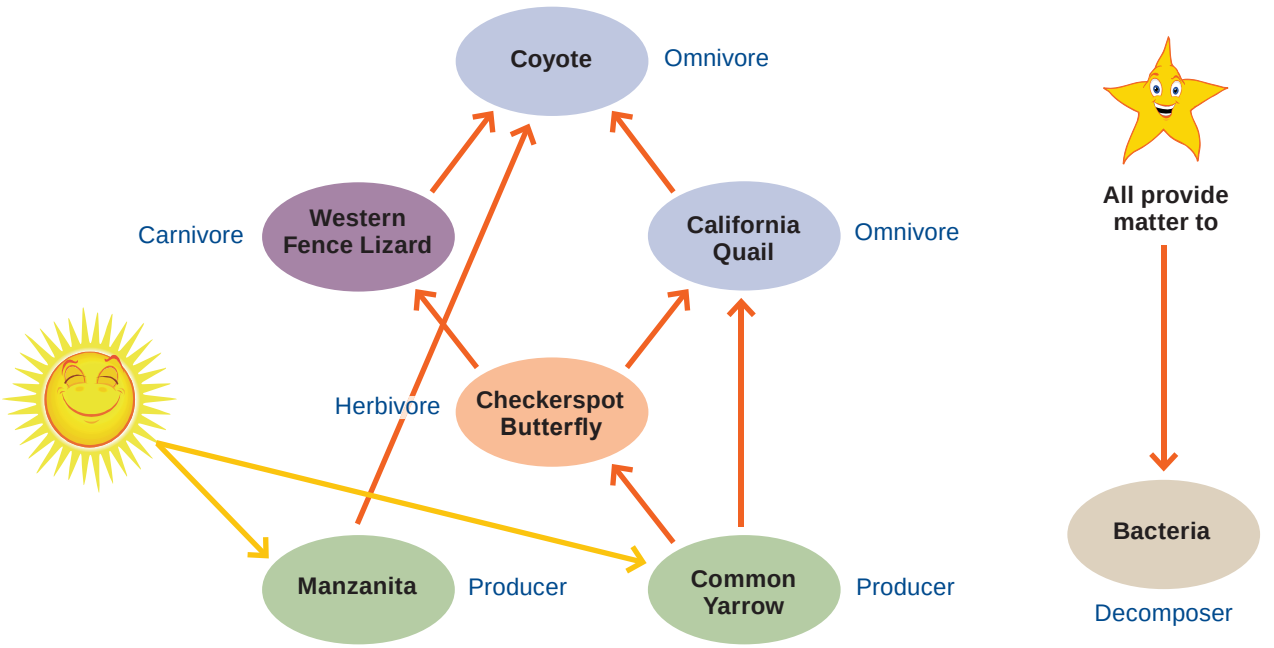
In California, cougars are the only predator that can kill adult pigs, but coyotes and black bears feed on piglets. People hunt feral adult pigs for sport.



Name: _____

California Chaparral Biome

Review this food web for an ecosystem in the California chaparral biome. Remember, there are many more organisms with connections to the ones you see here. Use the **Food Facts for Feral Pigs** handout to help you answer the questions below.



1. What organisms in this food web might feral pigs like to eat?

_____

2. What organisms in this food web might prey on feral pigs?

_____

3. What is the ecological role of the feral pig in this biome: producer, herbivore, omnivore, carnivore, or decomposer?

_____

4. What other organisms have the same role?

_____

Name: _____

5. Based on your answers, predict two or three ways you think introducing feral pigs would affect this ecosystem in the chaparral.

_____

_____

_____

_____

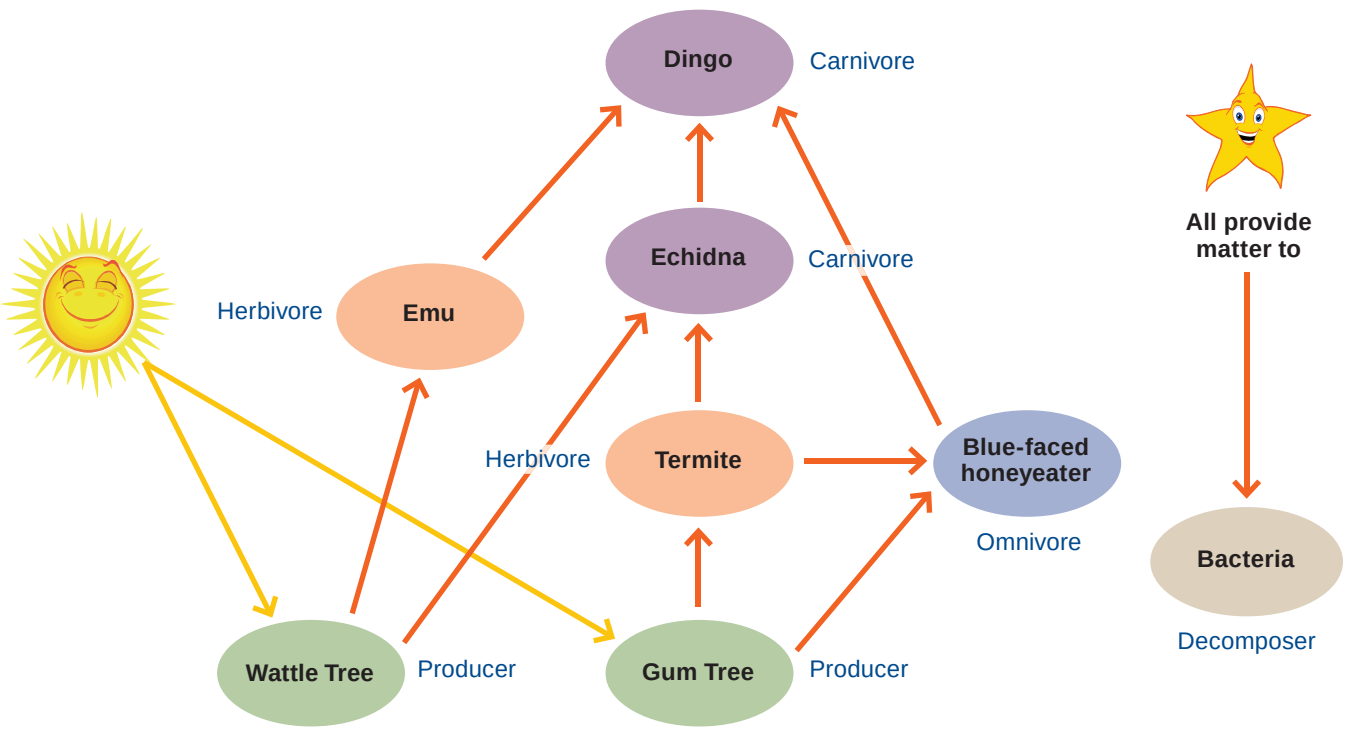
_____

_____

_____

Australian Savanna Biome

Review this food web for an ecosystem in the Australian savanna biome. Remember, there are many more organisms with connections to the ones you see here. Use the **Food Facts for Feral Pigs** handout to help you answer the questions below.



Name: _____

1. What organisms in this food web might feral pigs like to eat?

_____

2. What organisms in this food web might prey on feral pigs?

_____

3. What is the ecological role of the feral pig in this biome: producer, herbivore, omnivore, carnivore, or decomposer?

_____

4. What other organisms have the same role?

_____

5. Based on your answers, predict two or three ways you think introducing feral pigs would affect this ecosystem in the savanna.

_____

_____

_____

_____

_____

_____

_____

A Tale of Feral Pigs: Part 2

Feral pigs have similar ecological roles in the California chaparral and the Australian savanna. In both biomes, human beings are the pigs' major predator, although coyotes in California and dingoes in Australia can kill piglets. Many hunters think feral pigs are special since they are an "exotic" animal.

Even though they can hunt feral pigs every day of the year, hunters cannot keep up with the increasing pig population. Feral pigs can give birth to up to two litters a year. Each litter may have from five to six piglets.

Pigs damage local habitat because they eat almost anything. Because there are so many of them, they can upset the ecological balance in a local area. Pigs plunge their tough, flexible snouts into the topsoil, foraging for food. This is called "rooting." Beside eating grasses and roots, they dig for worms and grubs. Worms and grubs are important members of the food web because of their role as decomposers.

The feral pig's rooting action can sometimes reach as deep as three feet. One pig can disturb an entire acre of soil in just one day. By upsetting the soil, rooting can decrease its richness. After the pigs leave

Feral pig and piglets

Pig rooting

an area, sometimes only the toughest weeds can grow there.

Because pigs cannot sweat like humans, they cool off by rolling in wet soil. This is called "wallowing." Wallowing can expose bare soils to erosion during the rainy season and foul important water sources.

Feral pigs live in over half of California's 58 counties. They feed on grasses and weeds or wildflowers in the spring. During summer and fall, they eat acorns and fruits. Throughout the year, they feed on roots, worms, grubs, birds' eggs, frogs, and lizards. However, if these food sources are not available, pigs turn to other sources for their food. A good example of this is found on Santa Cruz Island, the largest of the Channel Islands. There, these feral pigs have completely changed the food web.

The Channel Islands are a few miles off the coast of Central and Southern California. Several plants and animals that live on the islands are endemic. This means that they cannot be found anywhere else in the world. Many years ago, pigs were introduced to several of the islands. They began rooting up native plants. The rooting caused a lot of soil erosion. It also spread weeds that are not native to the area. In a few places, the pigs even destroyed ancient Chumash Indian archaeological sites.

In the last few years, the pigs have attracted golden eagles to the island. The eagles like to eat piglets. The eagles also found that island foxes native to the island make a tasty meal. Today, less than 100 foxes remain on Santa Cruz Island. Recently, conservation groups began working to save the island fox. They decided that all pigs and golden eagles must be removed from the island so that the island fox can survive.

Many groups like those working on Santa Cruz Island are also at work in Australia. In Australia, the feral pig population is growing so fast, biologists cannot keep up with the damage the pigs cause. Today, about 4 million feral pigs run wild in the savanna,

floodplains, and wetlands of northern Australia. The wild pigs eat mostly plants. They also eat small animals. The pig's diet includes grasses, leaves, fruits, nuts, berries, insects, frogs, reptiles, birds' eggs, and small mammals, including the echidna (spiny anteater). Some of these plants and animals are now endangered or extinct in areas where the pigs live. Biologists are beginning to believe that the only way to protect habitat is to remove the pigs from some areas.

Echidna

Ranchers and farmers in Australia are also worried because they know that feral pigs can spread sickness to other animals. In 2001, hoof-and-mouth disease was a big problem in the United Kingdom. People were worried that the disease might come to Australia on a ship or plane. If that happened, hoof-and-mouth disease could infect the feral pigs. The sickness could spread very quickly to animals on farms and ranches. Many herds of sheep and cattle would have to be destroyed.

Golden Eagle

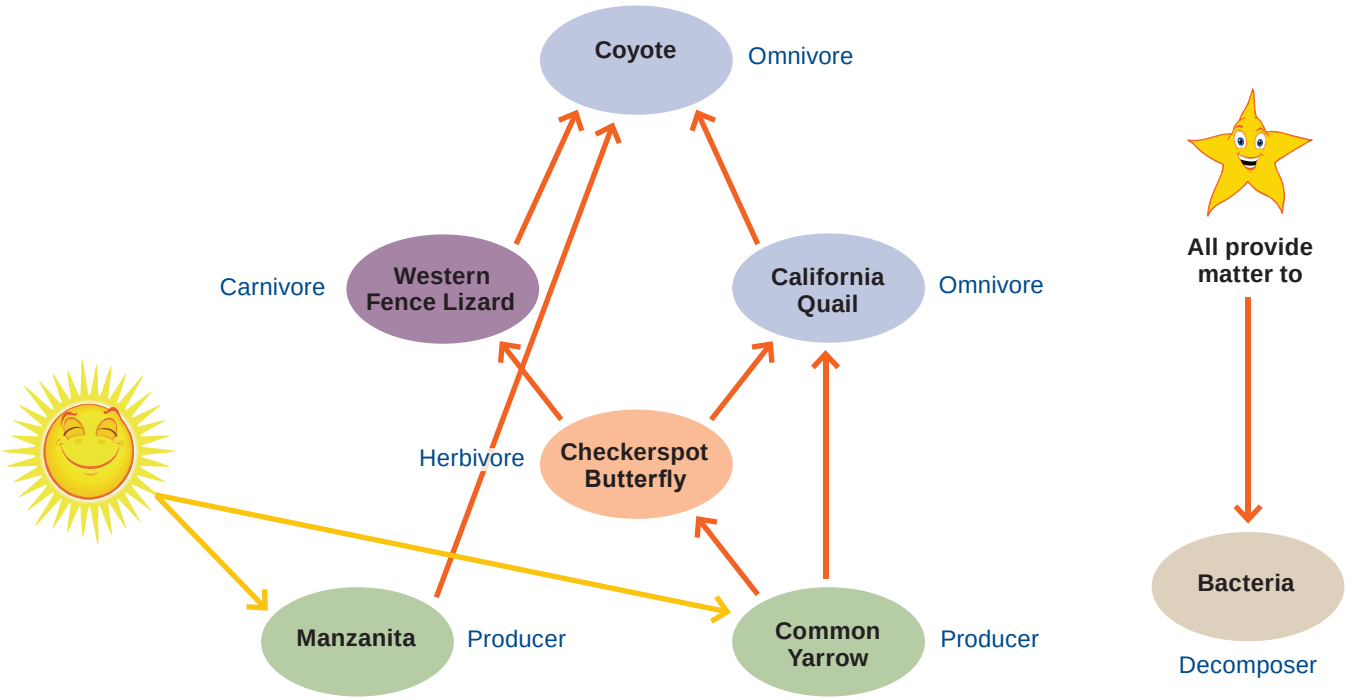
Feral pigs cause problems in both the California chaparral and the Australian savanna. The problems in these biomes are much the same. The existence of feral pigs in California and Australia demonstrate the costs, both to economic systems and to natural systems, of the introduction of non-native species.

Name: _____

Feral Pigs: California's Experience

Complete this activity based on what you read in ***A Tale of Feral Pigs—Part 2*** and the **Unit Dictionary**.

1. Add human beings and feral pigs to this food web. Draw in arrows to connect the feral pigs and humans to what they eat and what eats them. Look back at the story for help. Fill in the ecological role of the humans and the pigs.



Name: _____

2. What other organisms in this web have the same role as the pigs?

3. What organisms do the pigs directly affect? (Eating them or being eaten by them)

4. What organisms might the pigs indirectly affect? For example, do the pigs compete with another organism in the same role? Do they increase or decrease a population? Do those changes affect other populations?

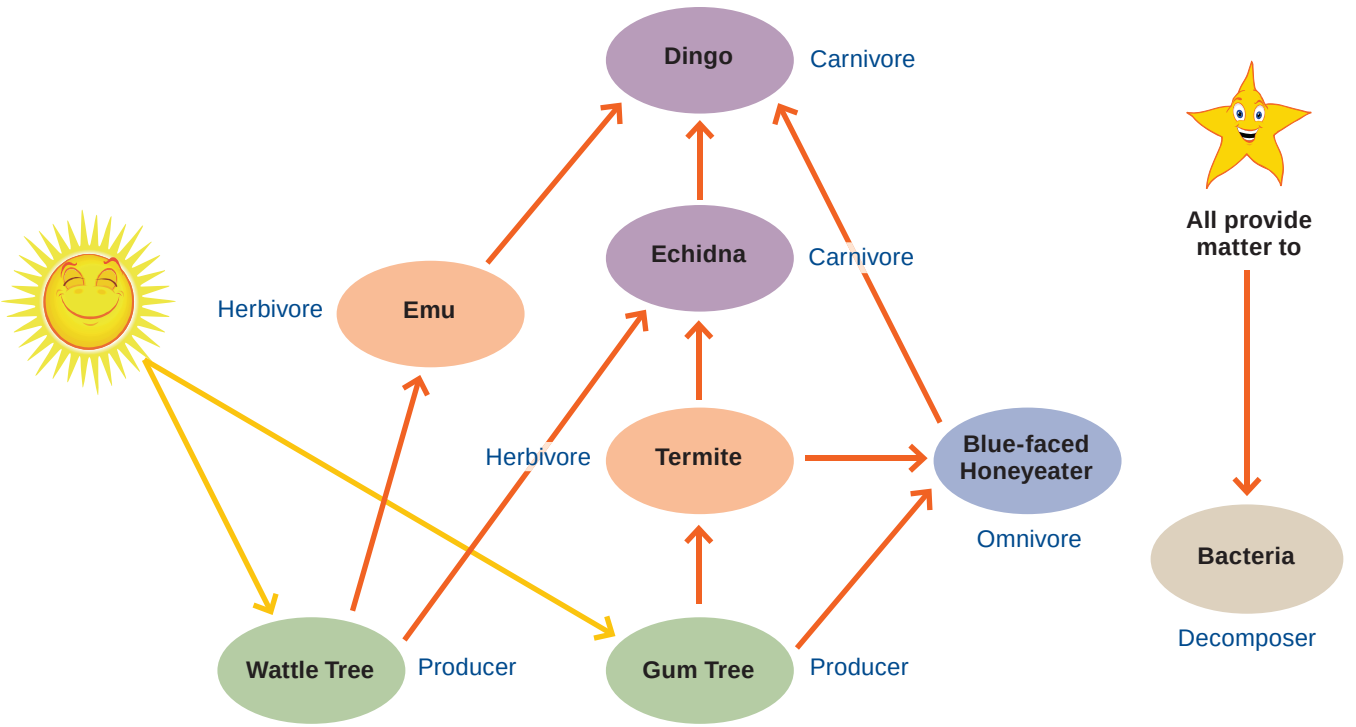
5. According to the story, what organisms are affected by the pigs' rooting behavior? (Include organisms in the food web, as well as others.)

Name: _____

Feral Pigs: Australia's Experience

Complete this activity based on what you read in ***A Tale of Feral Pigs—Part 2*** and the **Unit Dictionary**.

1. Add feral pigs to this food web. Draw in arrows to connect the feral pigs to what they eat and what eats them. Look back at the story for help. Fill in the ecological role of the pigs.



2. What other organisms fill the same ecological roles as the feral pig?

_____

3. What organisms do the pigs directly affect? (Eating them or being eaten by them)

_____

_____

_____

_____

Name: _____

4. What organisms might the pigs indirectly affect? For example, do the pigs compete with another organism in the same role? Do they increase or decrease a population? Do those changes affect other populations?

_____

_____

_____

_____

5. According to the story, what is another way that feral pigs can affect ecosystems in Australia?

_____

_____

_____

_____

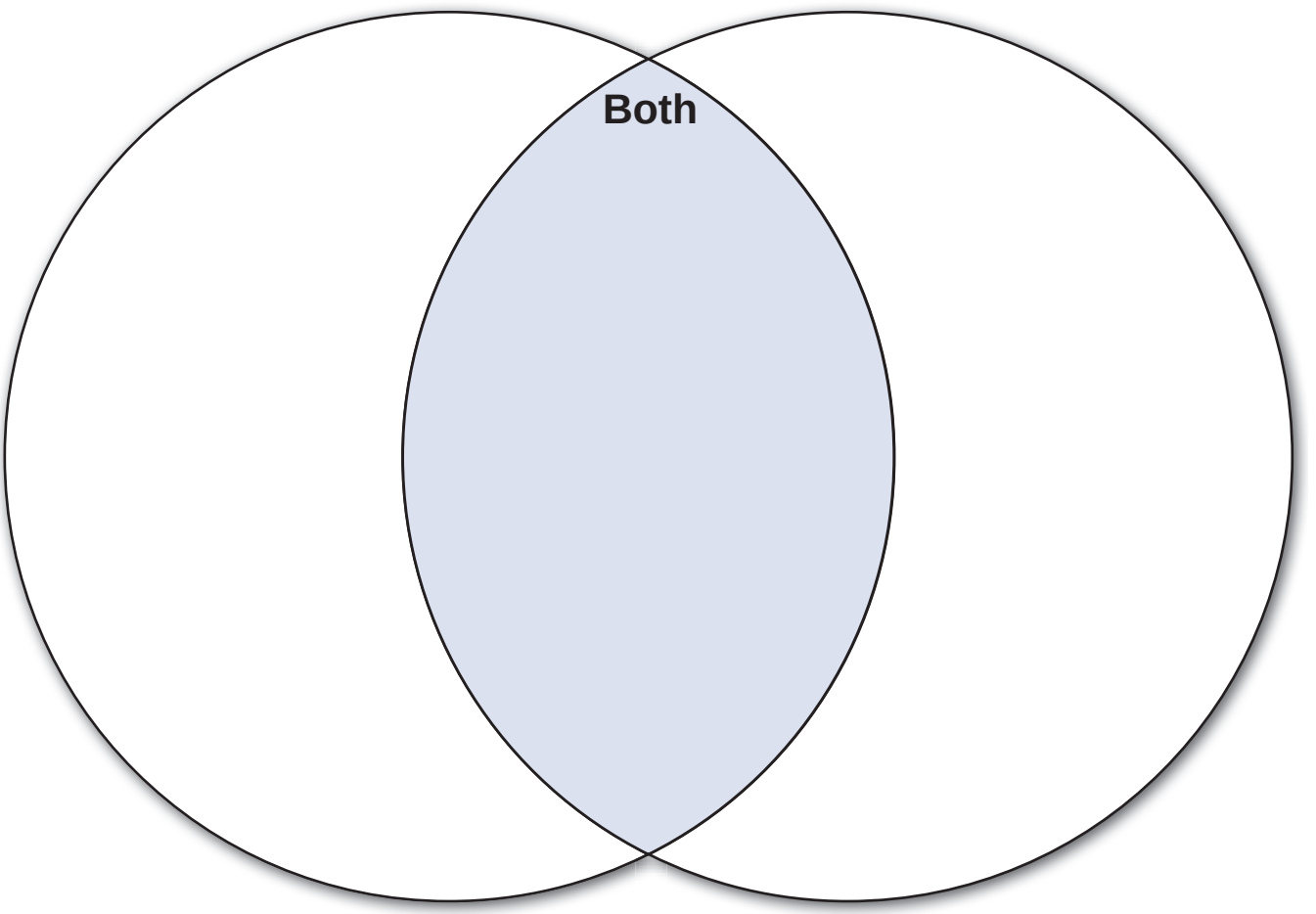
Name: _____

Use this Venn diagram to compare and contrast the effects of pigs in two different biomes.

Humans introduced pigs into both Australia and California. Eventually, some of the pigs escaped and became wild. ***A Tale of Feral Pigs—Part 2*** describes the effects of the pigs in two different biomes: chaparral in California and savanna in Australia.

Did the pigs have the same ecological role in both biomes? How were the effects the same in both places, and how were they different? Complete the Venn diagram below to answer these questions.

California Chaparral **Australian Savanna**

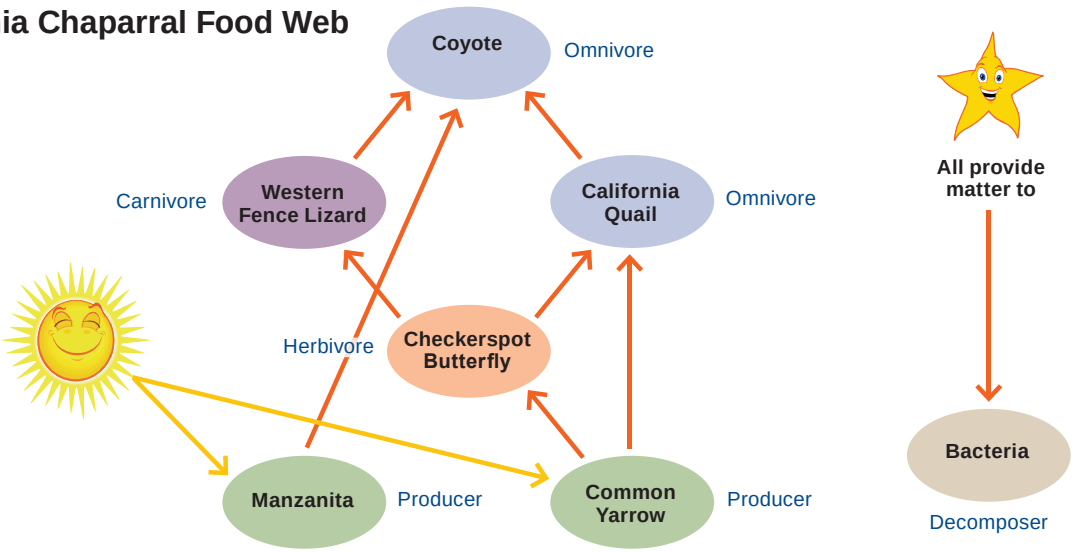


Name: _____

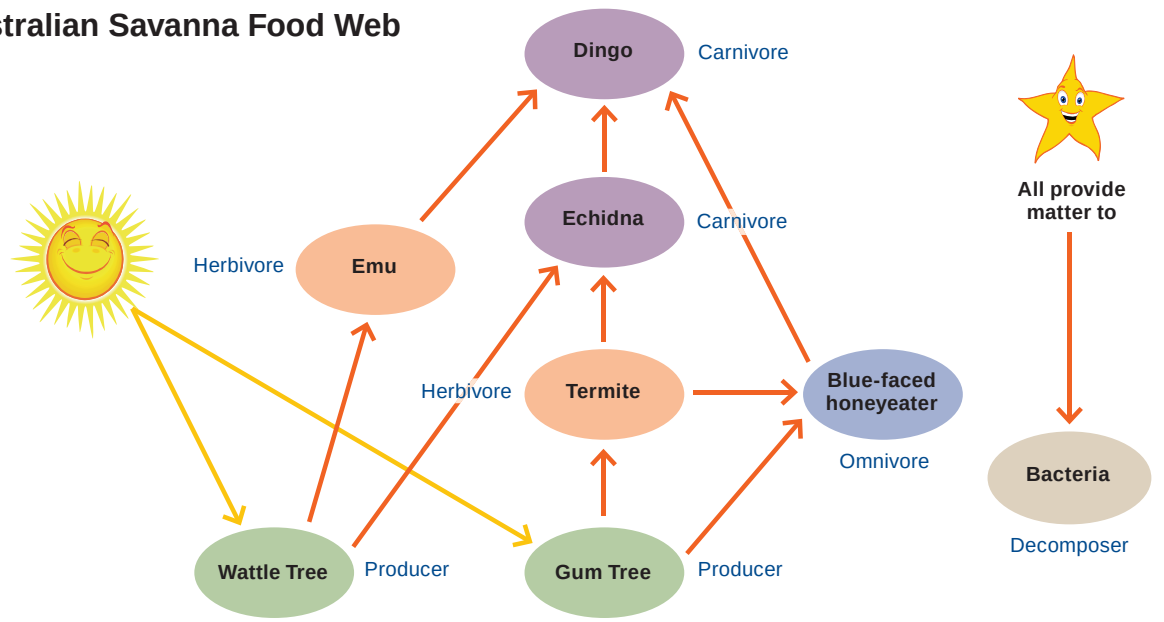
Based on your Venn diagram, explain how feral pigs have had similar effects on organisms in the same ecological roles in California and in Australia. Describe how they have affected producers, herbivores, omnivores, carnivores, and decomposers.

Chaparral and Savanna Food Webs

California Chaparral Food Web



Australian Savanna Food Web



The North Coastal Forests (Redwood) Story

From San Francisco to the Oregon border, the California Fish and Game Commission has listed coho salmon as "endangered." Why? Let's look at some human practices that may have affected them.

Adult coho salmon leave the ocean and enter freshwater streams in California's North Coastal Forests (Redwood) to lay their eggs, or spawn. They spawn between September and January in small, shallow streams with gravel bottoms. The females dig gravel nests and lay thousands of eggs in them. Once the eggs hatch, the young fish, or fry, emerge from the gravel. They live in the streams for two to three years before going to sea.

These young coho salmon rely on the clear pools in these streams as their habitat. Shaded by towering redwoods, the water remains cool even in the summer. Rocks, fallen stumps, and overhanging plants create hiding places that help these fish avoid predators and find food. Young coho salmon and other fish fry feed on insects, spiders, and small aquatic animals.

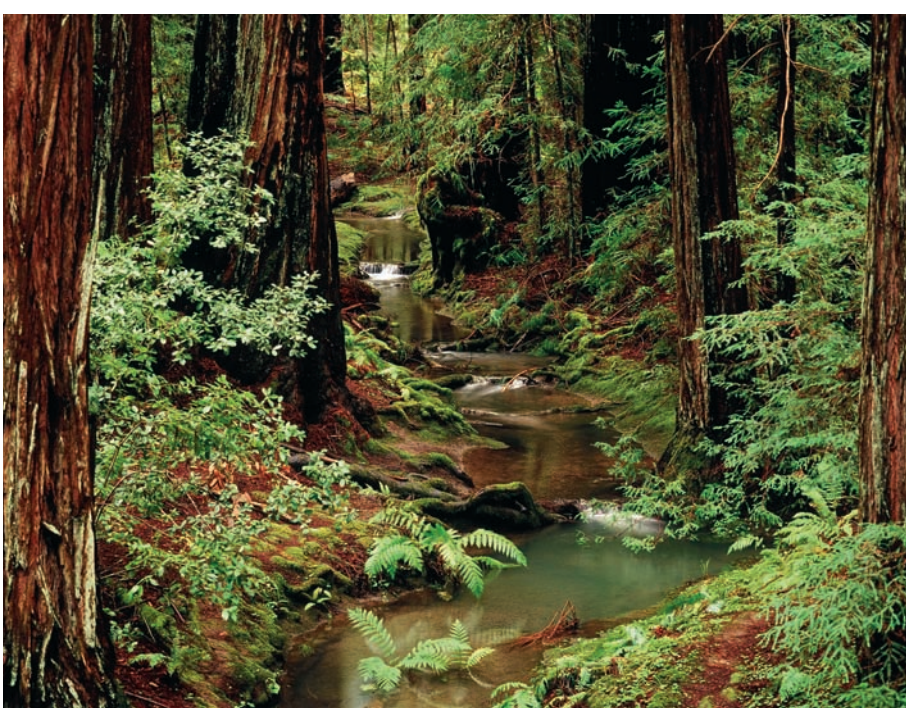
Coho salmon

Some human practices have made these redwood forest streams less healthy for coho salmon. Scientists believe these human practices are the main reason coho salmon are endangered. For example, certain logging practices can change stream systems. Logging means to cut trees for lumber. Sometimes, all of the trees on a hillside are logged at the same time, exposing the soil and causing silt to wash down into streams. Silt is composed of fine grains of soil. Siltation occurs when the silt builds up in rivers or streams. The silt clouds the gravel beds, killing salmon eggs and young fry. Removing trees along streams

Logged area

causes more siltation and takes away the hiding places of fish. Logging all the trees in one area can also increase the amount of sunlight that reaches the stream. The water temperature rises, becoming too hot for the young fish.

Logging and other human practices have caused Northern California's coho salmon population to drop 70 percent since 1960. Poor stream quality has affected the plants and animals that live there. When the numbers of salmon and other stream fish species drop, their predators have less to eat. Less matter is transferred to their predators. If coho predators have less to eat, their numbers may drop also. Less matter will be transferred to the animals that eat them. As a result, the transfer of matter through the whole coastal redwood forest ecosystem can be altered.



Redwood forest

The Salton Sea Story

The Salton Sea is in Southern California's Colorado Desert. It formed between 1905 and 1907 when the Colorado River flooded and broke through an irrigation canal. People had made the canal to bring water to farms.

Even though the Salton Sea was created by human activities, it has become an important ecosystem. Most of the land around the Salton Sea is agricultural. At the northern end of the sea is a recreation area. Many visitors come to the Salton Sea for bird watching, camping, and boating. The sea has been stocked with game fish for people to catch. The fish also provide food for huge numbers of waterfowl that fly over the sea during their migrations. The southern end of the sea is a wildlife refuge.

Because the Colorado Desert is very dry, water habitats like the Salton Sea are important to wildlife. However, human practices related to agriculture, recreation, and irrigation have harmed the sea. Streams have been dammed, and the water has been sent to farms and cities. Little fresh water flows into the sea. Instead, salts, pesticides, and other chemicals drain into the sea from farm fields. Fish and waterfowl take in these chemicals. When birds of prey eat the fish, the chemicals pass into them. Pollution and changes to oxygen levels have caused many fish and birds to die.

Salton Sea

Because the Salton Sea receives so little fresh water, its salinity is increasing. This means the water is getting more salty. Scientists are concerned that it may soon become too salty for the fish and other organisms living in it. This change will affect the transfer of matter in the Salton Sea food webs.

The Salton Sea food webs are supported by tiny drifting plants called phytoplankton that use the Sun's energy to make food. The phytoplankton are eaten by zooplankton (tiny drifting

Pelican fishing

animals) and worms. Small fish eat the worms and zooplankton. Larger fish eat the small fish. Birds such as pelicans, cormorants, and osprey eat the larger fish.

Scientists do not know which organisms will be affected first by the increased salinity. They also do not know how those changes will influence other species. They do know that changes to one species in a food web will cause changes for both the animals it eats and the animals that eat it. In other words, the transfer of matter between a species and its prey and predators will change. For example, if the number of worms at the base of the food web decreases, less food would be available to the small fish that eat the worms. This could result in a decrease in the number of small fish. Fewer small fish would mean that less food is available to larger fish. As a result of one change, the transfer of matter through the whole Salton Sea ecosystem could be altered.

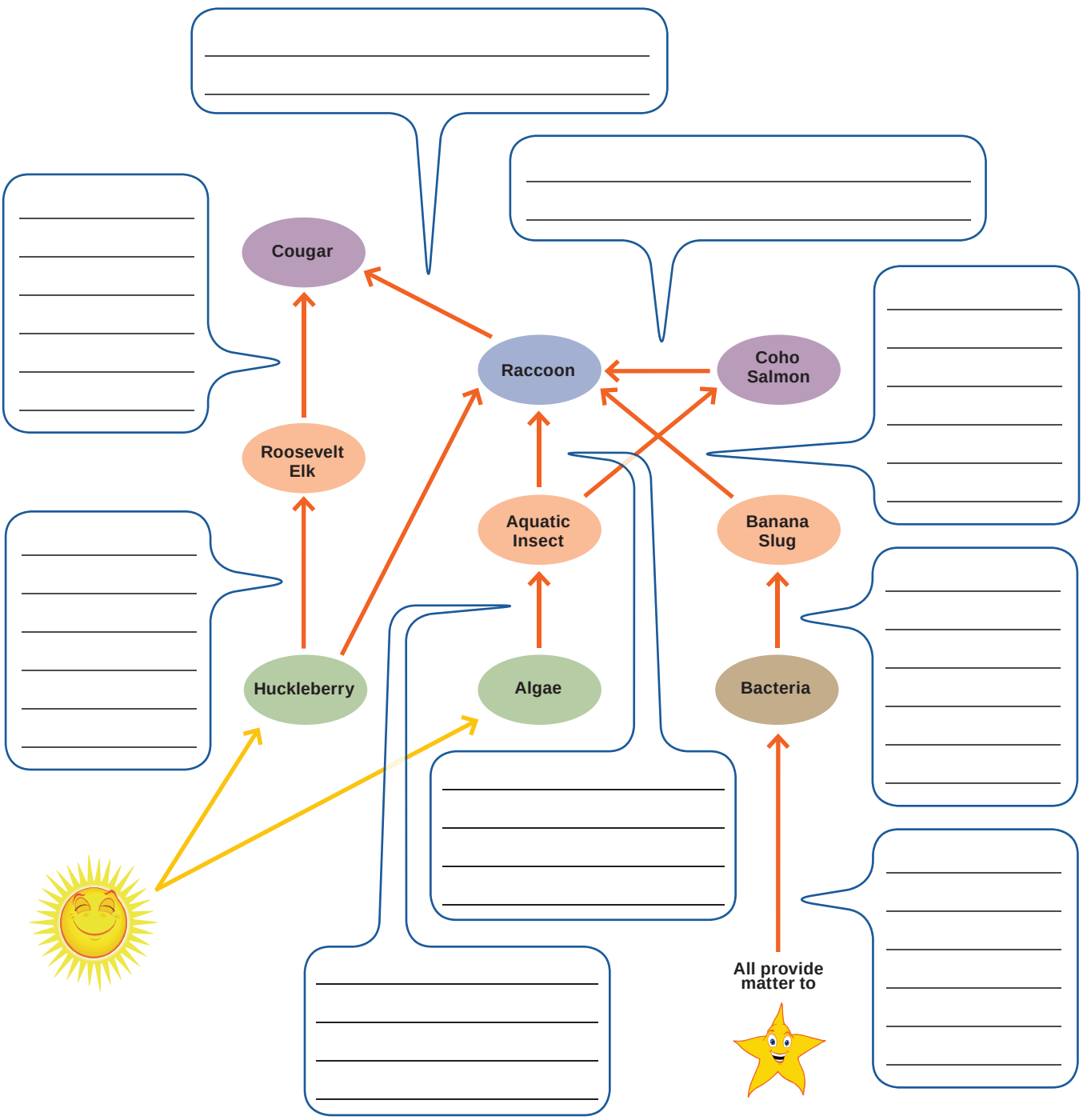
Palm trees in Salton Sea

Name: _____

How Does Logging Affect Food Webs in California's Redwood Forests?

The story described how logging affects the number of coho salmon in a stream. It also said that silt affects aquatic insects which coho salmon eat.

When the number of one species in an ecosystem changes, others often change. What would happen if there are fewer aquatic insects? What would happen if there are fewer coho salmon? How would this affect the flow of matter in this natural system? In the blanks next to the arrows, describe how the flow of matter may change if there are fewer aquatic insects or coho salmon.

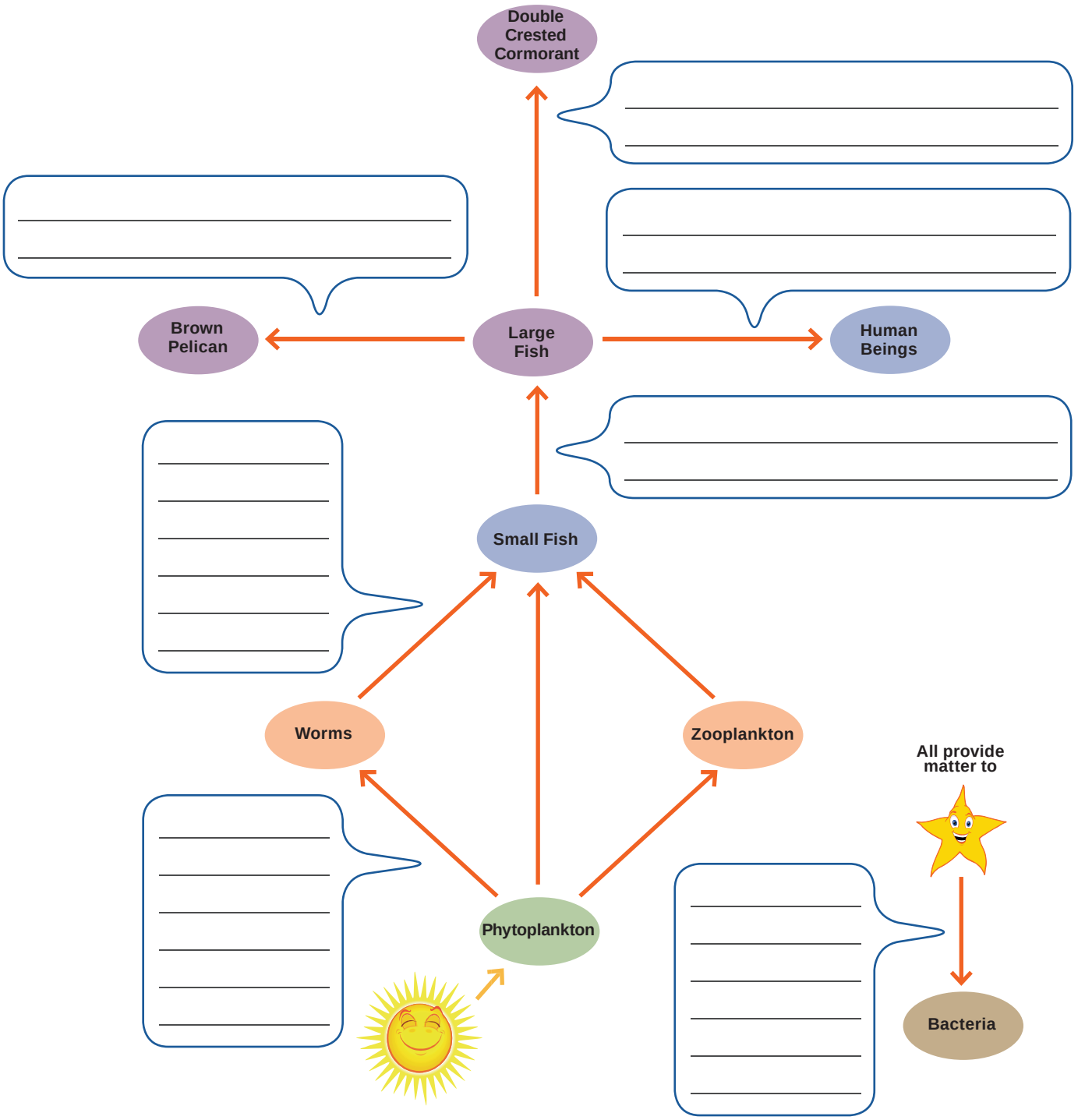


Name: _____

How Have Agriculture and Irrigation Affected Food Webs in California's Salton Sea Desert Ecosystem?

The story you read described how farming affects the amounts of nutrients and salinity in the Salton Sea. Scientists are concerned that high salinity will hurt plants and animals in the Sea.

Many organisms higher in the food web rely on worms that eat phytoplankton. If the salt level gets too high for worms and very, few will live. How would this affect the flow of matter in this natural system? In the blanks next to the arrows, describe how the flow of matter may change if there are fewer worms.

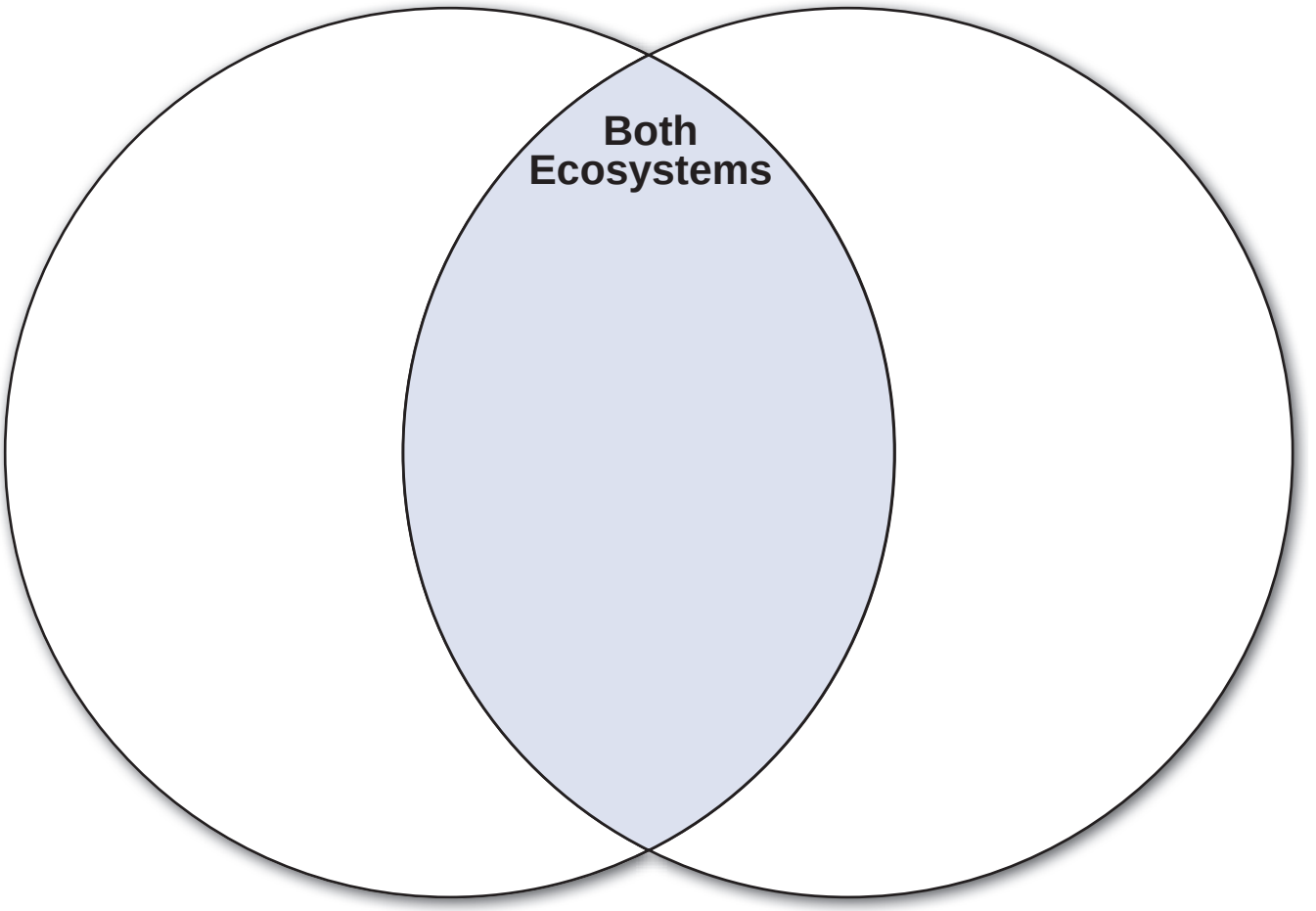


Name: _____

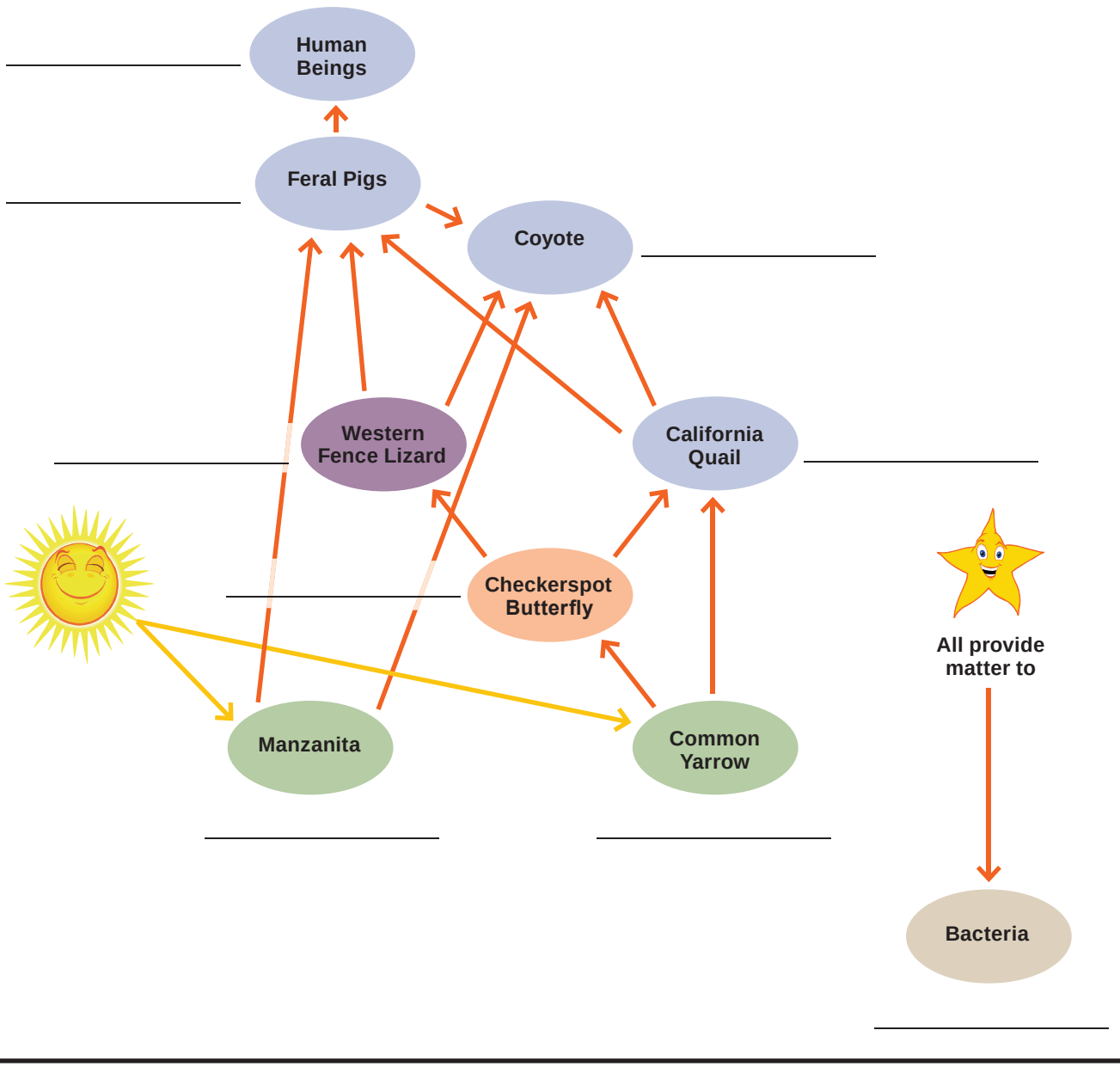
Compare the effects of human activities in the redwood forest and Salton Sea ecosystems. List at least two effects in each section of the diagram. List effects that are found in both ecosystems in the center section where the circles overlap.

North Coastal Forest (Redwoods)

Salton Sea



Feral Pigs in the Food Web



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